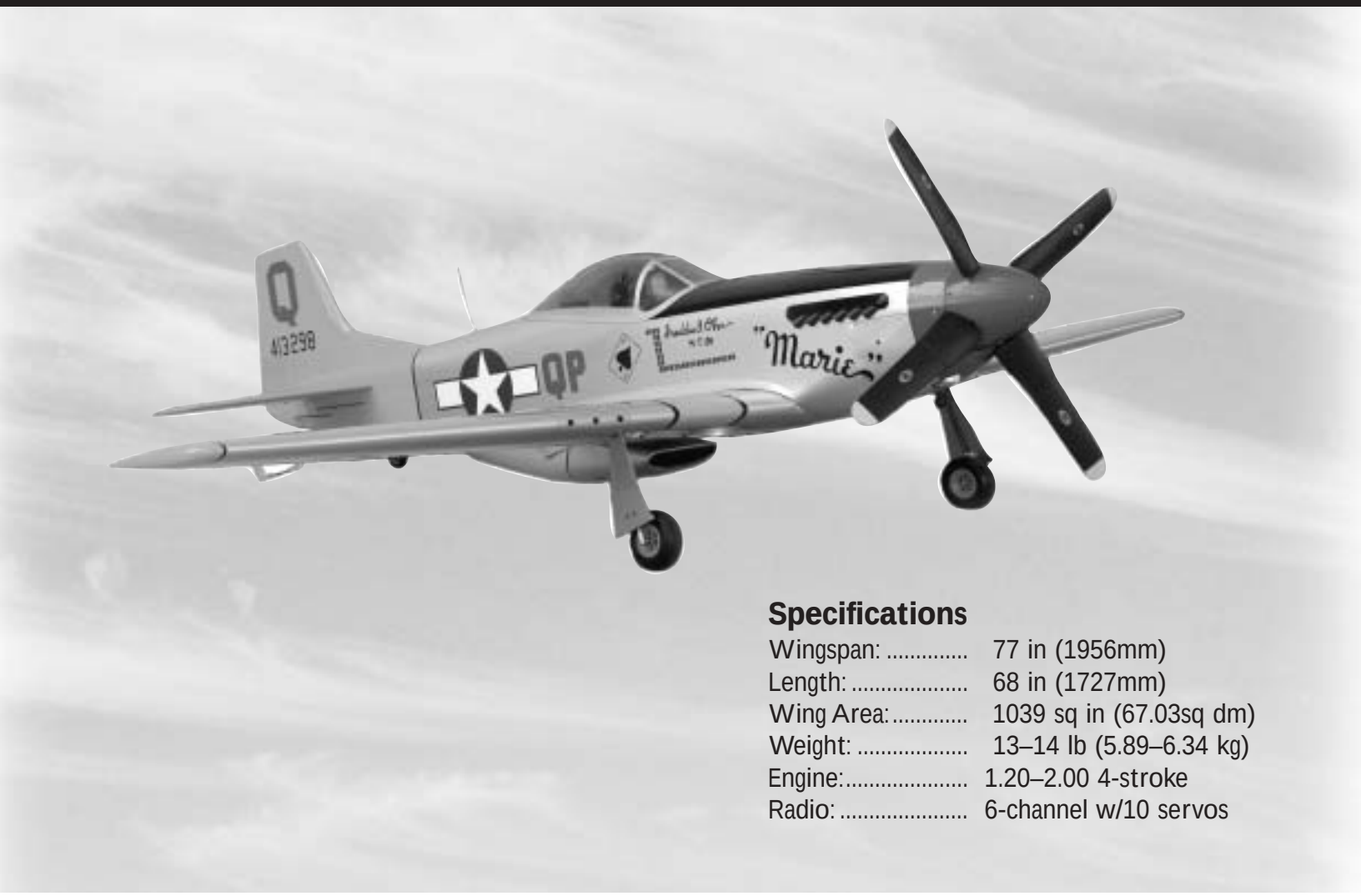
HANGAR 9®

WE GET PEOPLE FLYING

P-51 Mustang 1.50 ARF

ASSEMBLY MANUAL



Specifications

Wingspan:	77 in (1956mm)
Length:	68 in (1727mm)
Wing Area:	1039 sq in (67.03sq dm)
Weight:	13–14 lb (5.89–6.34 kg)
Engine:	1.20–2.00 4-stroke
Radio:	6-channel w/10 servos

Congratulations on your purchase of the Hangar 9® P-51 Mustang ARF. This sport scale model warbird is intended for the modeler wanting to experience the thrill of being a Fighter Ace in the European Theater during WW-II. The Hangar 9 P-51 is a low-wing, high-performance plane. If this is your first attempt at flying this type of aircraft, please consult a more experienced pilot to help in the setup and initial flights.

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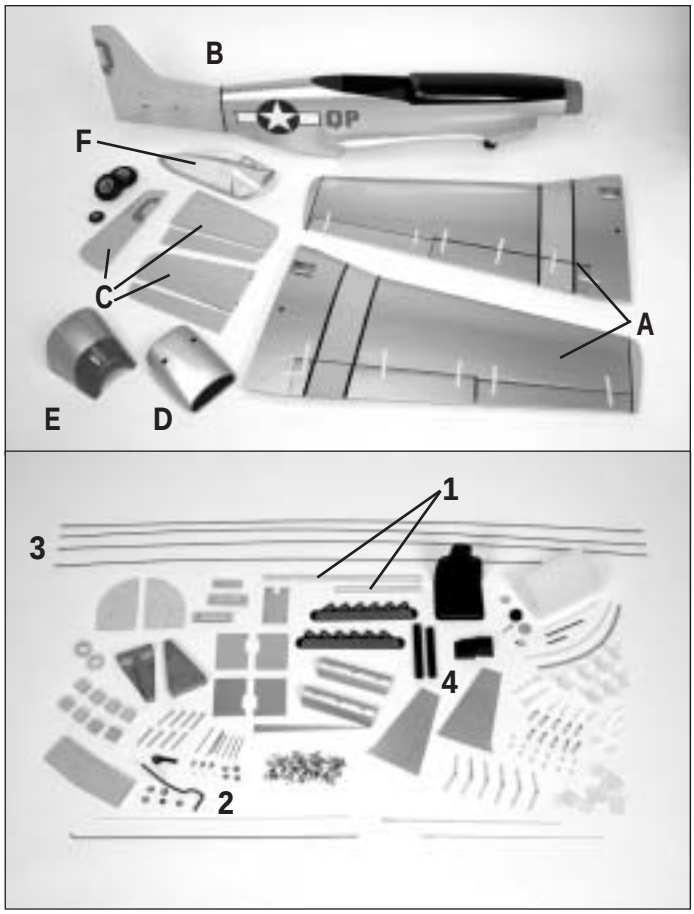
Contents of Kit



Large Parts

A. HAN2401	Wing Set with Joiner
B. HAN2404	Fuselage
C. HAN2402	Tail Set
D. HAN2405	Fiberglass Belly Scoop
E. HAN2406	Fiberglass Cowl
F. HAN2407	Canopy

Small Parts

1. HAN2403	Aluminum Stabilizer Tube Set
2. HAN2409	Tail Wheel Assembly
3. HAN2410	Pushrod Set
4. HAN2412	Scale Detail Set

Additional items sold separately

HAN2408	Mechanical Retract Set
HAN2411	Decal Set

Additional Required Equipment

Radio Equipment

- 6-channel radio system (minimum)
- 8 standard servos (JRPS537 recommended or equivalent)
- 2 Low-Profile Retract Servos (JRPS703)

Recommended JR Systems

- JR XF652
- JR XP783
- JR XP8103
- PCM 10X

JR PCM 10X

JR XP8103

Recommended Engines

- 1.50–2.18 2-cycle engines
- 1.20–2.00 4-cycle engines

4-Cycle Engine

- Saito™ 1.80–2.00

Saito 1.80
SAIE180

Saito 200Ti
SAIE200TI

Additional Required Tools and Adhesives

Tools

- Drill
- Drill Bits: 1/16", 1/8", 3/32", 5/64", 5/32"
- Phillips screwdriver (small, medium)
- Pliers
- Side Cutters
- Moto-tool w/cut-off wheel
- Hobby knife with #11 blade
- 90-degree triangle
- Straight edge
- Canopy scissors
- Side cutters
- Adjustable wrench
- Hex wrench

Other Required Items

- Mixing sticks for epoxy
- Epoxy brushes
- Rubbing alcohol
- Sanding bar
- Sandpaper (medium)
- Paper towels
- Wax paper
- Felt-tipped pen or pencil
- Measuring device (e.g. ruler, tape measure)
- T-pins
- String
- Radio packing foam
- Petroleum jelly

Adhesives

- Thin CA (cyanoacrylate) glue
- Thick CA (cyanoacrylate) glue
- CA remover/debonder
- 6-minute epoxy
- 30-minute epoxy
- Pacer Z-42 Threadlock
- Canopy glue (RC-56)
- Masking tape (3M blue recommended)

Other Items Needed (not included in the kit)

- Propeller (consult your engines instruction manual)
- 24” Servo Lead Extension (JRPA102)
- 6” Servo Lead Extension (JRPA094)
- Large servo arm (JRPA212) (2)
- Propeller (consult your engines instruction manual)
- 5" P-51 Spinner

Warning

An RC aircraft is not a toy! If misused, it can cause serious bodily harm and damage to property. Fly only in open areas, preferably at AMA (Academy of Model Aeronautics) approved flying sites, following all instructions included with your radio and engine.

Before Starting Assembly

Before beginning the assembly of your P-51, remove each part from its bag for inspection. Closely inspect the fuselage, wing panels, rudder, and stabilizer for damage. If you find any damaged or missing parts, contact the place of purchase.

If you find any wrinkles in the covering, use a heat gun or covering iron to remove them. Use caution while working around areas where the colors overlap to prevent separating the colors.

Using the Manual

This manual is divided into sections to help make assembly easier to understand, and to provide breaks between each major section. In addition, check boxes have been placed next to each step to keep track of each step completed. Steps with two boxes indicate that the step will require repeating, such as for a right or left wing panel, two servos, etc. Remember to take your time and follow the directions.

Warranty Information

Horizon Hobby, Inc. guarantees this kit to be free from defects in both material and workmanship at the date of purchase. This warranty does not cover any parts damage by use or modification. In no case shall Horizon Hobby's liability exceed the original cost of the purchased kit. Further, Horizon Hobby reserves the right to change or modify this warranty without notice.

In that Horizon Hobby has no control over the final assembly or material used for the final assembly, no liability shall be assumed nor accepted for any damage of the final user-assembled product. By the act of using the product, the user accepts all resulting liability.

Once assembly of the model has been started, you must contact Horizon Hobby, Inc. directly regarding any warranty question that you have. Please do not contact your local hobby shop regarding warranty issues, even if that is where you purchased it. This will enable Horizon to better answer your questions and service you in the event that you may need any assistance.

If the buyer is not prepared to accept the liability associated with the use of this product, the buyer is advised to return this kit immediately in new and unused condition to the place of purchase.

Horizon Hobby
4105 Fieldstone Road
Champaign, Illinois 61822
(217) 355-9511
www.horizonhobby.com

Section 1: Hinging the Ailerons

Required Parts

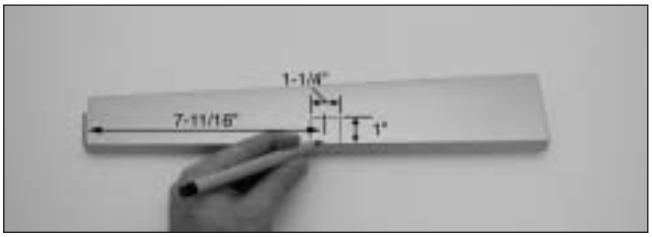
- Right and left wing panels w/ailerons
- CA hinges (6)

Required Tools and Adhesives

- Thin CA glue
- Paper towel
- CA remover/debonder
- T-Pins

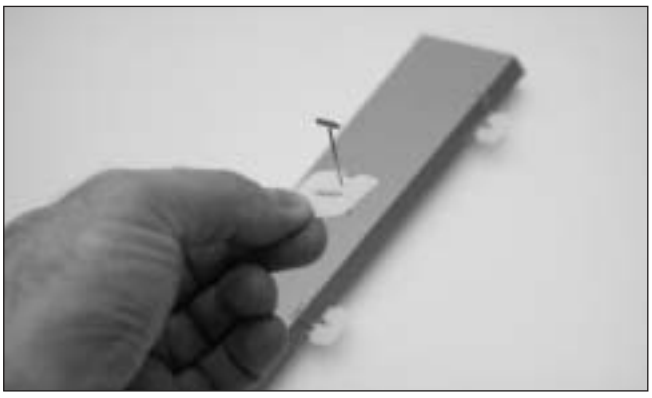
☐ ☐ **Step 1**

Carefully remove the tape holding the aileron to the wing. Locate the hardwood control horn mount in the aileron. The center of the mount is located 7 $^{11}/_{16}$" inches from the tip end of the aileron (narrow end). The plate is 1 $^{1}/_{4}$" wide and 1" deep.



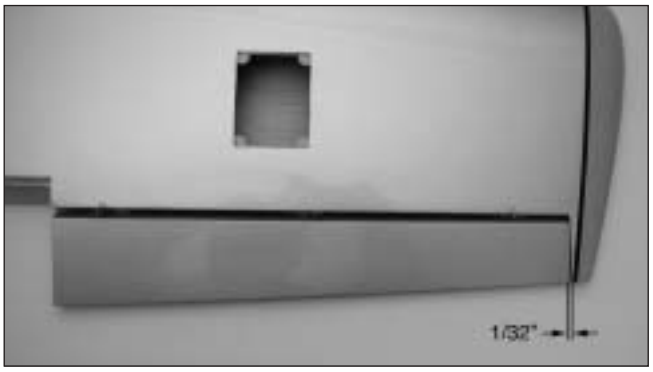
☐ ☐ **Step 2**

Locate three of the large CA hinges and place a T-pin in the center of the hinge as shown. Slide each of the three hinges into the aileron so the T-pin is resting against the leading edge of the aileron.



☐ ☐ **Step 3**

Slide the aileron onto the wing until there is only a slight gap between the aileron and wing panel. Remove the T-pins and snug the aileron against the wing panel. Slide the aileron towards the wing tip until there is only a 1/32" gap between the end of the aileron and wing tip.



Note: Do not use CA accelerator during the hinging process. The CA must be allowed to soak into the hinge to provide the best bond. Using accelerator will not provide enough time for this process.

☐ ☐ **Step 4**

Deflect the aileron and apply thin CA to the hinge. Apply enough CA to completely saturate the hinge. Use care not to deflect the aileron so it pulls away from the wing. When the hinge is glued in place, there should be no more than a 1/32" hinge gap maintained throughout the length of the aileron.

☐ ☐ **Step 5**

Turn the wing panel over, deflect the aileron in the opposite direction and apply thin CA to the other side of the hinges as described in the previous step. Make sure the thin CA penetrates completely into both the aileron and wing panel.

☐ ☐ **Step 6**

Use CA remover/debonder and a paper towel to remove any excess CA accumulated on the wing or aileron surface. Allow time for the CA to completely cure before moving to the next step.

☐ ☐ **Step 7**

Firmly grasp the wing and aileron and gently pull on the aileron to ensure the hinges are secure and cannot be pulled apart. Use caution when gripping the wing and aileron to avoid crushing the structure.

☐ ☐ **Step 8**

Work the aileron up and down several times to work in the hinges and check for proper movement.

☐ ☐ **Step 9**

Repeat Steps 1 through 8 for the remaining aileron.

Section 2: Aileron Servo Installation

Required Parts

- Wing assembly
- Aileron servos w/mounting hardware (2)
- Servo hatch screws (#2 x 3/8") (4)
- Large Servo Arm (JRPA212) (1 pkg)
- Servo mounting blocks (4)
- 24" Servo Lead Extension (JRPA102)
- Aileron servo hatch (2)

Required Tools and Adhesives

- Phillips screwdriver
- String/dental floss
- Drill Bit: 1/16", 5/64"
- 6-minute epoxy
- Felt-tipped pen
- Ruler
- Drill

☐ ☐ **Step 1**

Locate the aileron hatch. The slot for the aileron horn is positioned towards the trailing edge of the wing and towards the wing tip as shown.

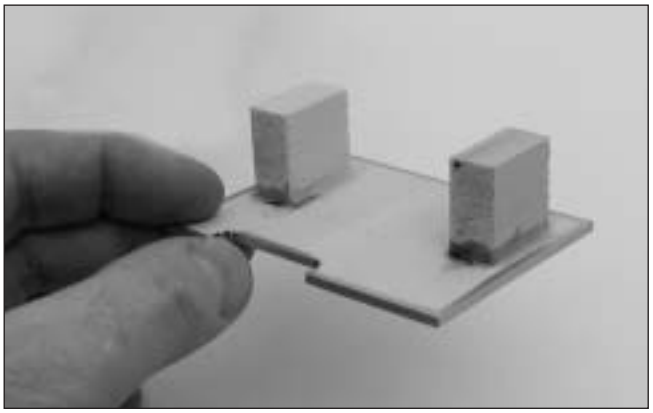
Note: The aileron servo is mounted directly to the hatch.

☐ ☐ **Step 2**

Install the recommended servo hardware (grommets and eyelets) supplied with the servo. Temporarily install a long half servo arm (JRPA212) onto the servo and position the servo onto the hatch so the servo arm is centered in the notch. Also ensure the servo arm does not extend past the edge of the servo hatch. Once satisfied, mark the location for the servo mounting blocks.

☐ ☐ **Step 3**

Locate the servo mounting blocks. Use 6-minute epoxyto glue them in place on the marks made in the previous step. Let the epoxy fully cure before proceeding to the next step.



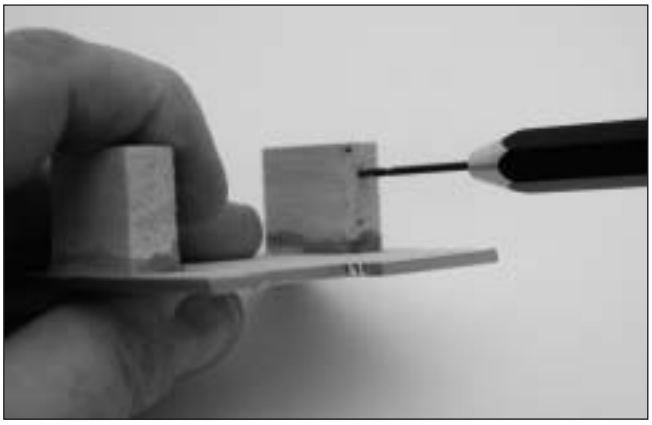
☐ ☐ **Step 4**

Place the aileron servo between the mounting blocks and use a felt-tipped pen to mark the location of the four servo mounting screws. Note that the servo must not touch the hatch in order to isolate engine vibration.

Note: Before mounting the servo, it is suggested to electronically center the servo using the transmitter, then install the servo arm to avoid having to remove the servo and center the arm later. It may be necessary to slightly trim one of the servo mounting blocks to clear the servo wire.

☐ ☐ **Step 5**

Remove the servo and use a 1/16" drill bit to predrill the holes for the servo mounting screws marked in the previous step. Use the screws supplied with the servo to mount it to the servo mounting blocks.



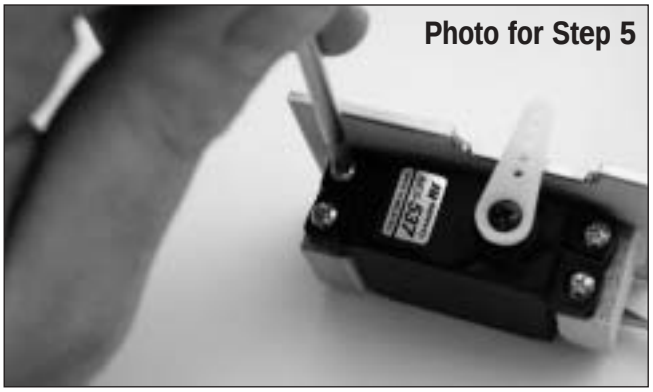
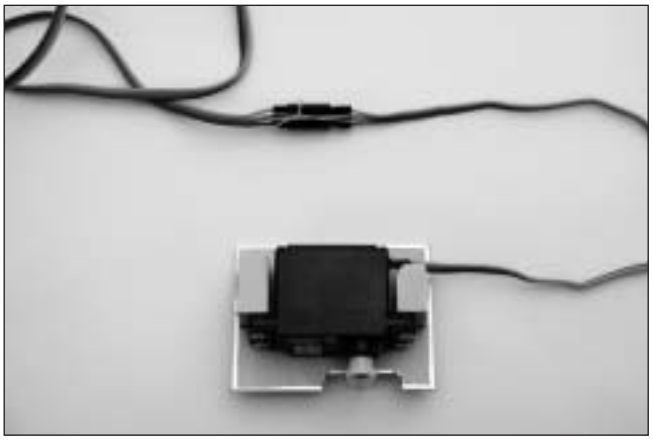


Photo for Step 5

☐ ☐ **Step 6**

Connect a 24" Servo Lead extension (JRPA212) to the servo lead. Secure the connectors by tying them in a knot using dental floss (as shown) or by using a commercially available connector clamp to prevent the servo leads from becoming disconnected.

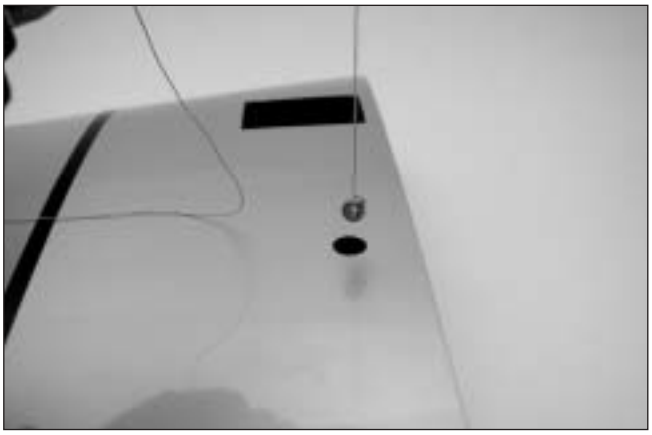


Note: It is always a good idea to secure the servo connector and servo extension together to prevent the wires from becoming unplugged inside the wing.

Section 2: Aileron Servo Installation

☐ ☐ **Step 7**

Use a piece of string with a small weight (such as a wheel collar) attached as a device to pull the servo lead through the wing. Lower the weight through the opening at the root of the wing as shown.

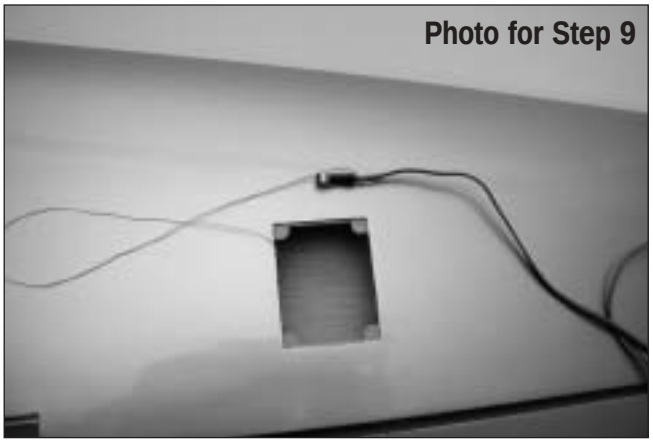


☐ ☐ **Step 8**

Stand the wing on the tip and allow the weight to drop through the wing until it appears in the opening for the servo leads. It may require a little help to pass by the wing ribs in the form of slightly shaking the wing.

☐ ☐ **Step 9**

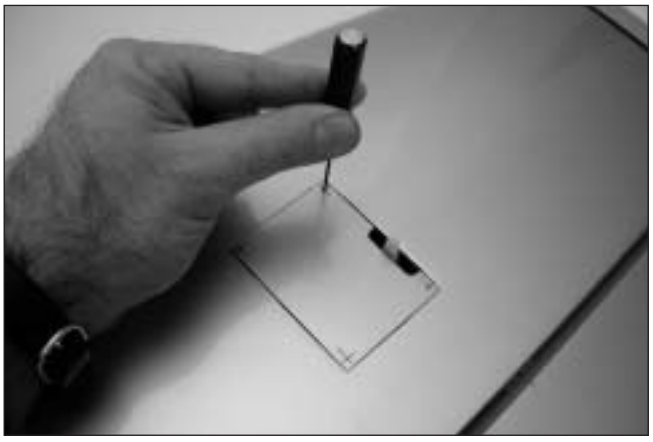
Tie the string onto the servo extension. Gently pull the extension through the wing using the string. Untie the string when the servo lead has been pulled through. Use tape to secure the servo lead to the wing to prevent it from falling back into the wing panel.



☐ ☐ **Step 10**

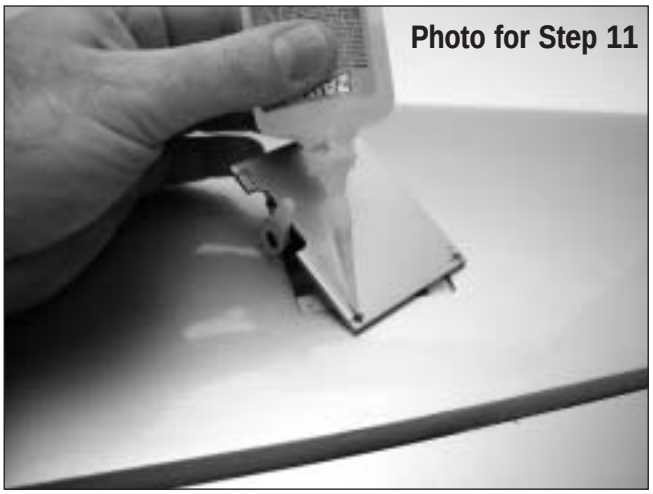
Place the hatch cover in position in the aileron opening. Measure in 1/8" on all four sides of the hatch. Drill four 1/16" holes at the intersections of the lines as shown.

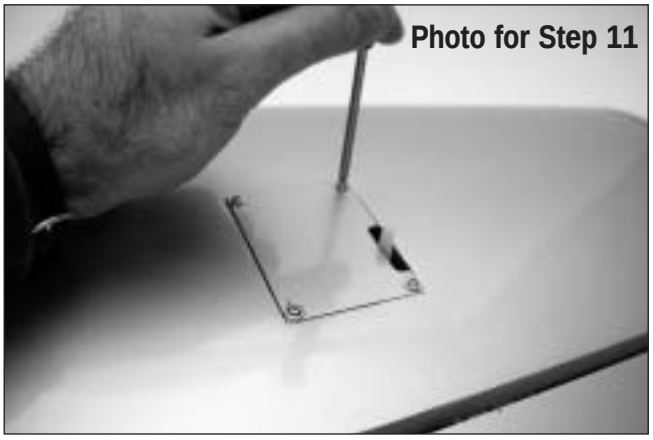
> **Note**: Drill through the servo hatch and the underlying hatch mounts. Use caution not to accidentally drill through the top of the wing.



☐ ☐ **Step 11**

Remove the servo hatch cover and re-drill the holes using a 5/64" drill bit. Use 2–3 drops of thin CA to harden the underlying wood. This will prevent the screws from crushing the wood when they are tightened. Secure the hatch using four #2 x 3/8" screws.





☐ **Step 12**

Repeat Steps 1 through 11 for the remaining aileron servo.

Section 3: Aileron Linkages

Required Parts

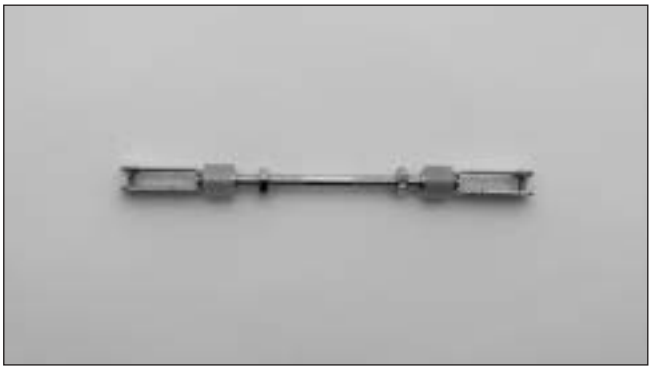
- Wing assembly
- Mounting screws (6)
- Clevis keeper (4)
- 4-40 nuts (4)
- Control horn (2)
- Metal clevis (4)
- 4-40 x 2" threaded rod (2)
- #2 x 3/8" screws (6)

Required Tools and Adhesives

- Thin CA
- Drill Bit: 1/16", 5/64"
- Felt-tipped pen
- Phillips screwdriver
- Drill

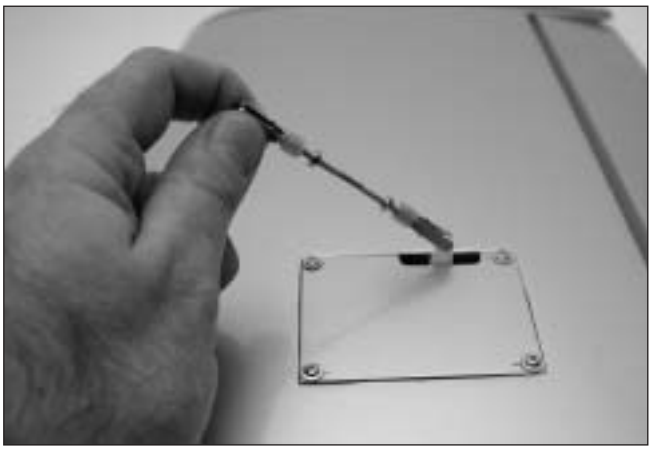
☐ ☐ **Step 1**

Prepare the 4-40 aileron linkage by placing the clevis keepers onto the metal clevises. Thread a 2-56 nut onto each end of the 4-40 x 2" threaded rod. Thread a clevis onto each end of the threaded rod. The threaded rod should just be visible between the forks of the clevis.



☐ ☐ **Step 2**

Attach the assembled control linkage to the aileron servo arm.

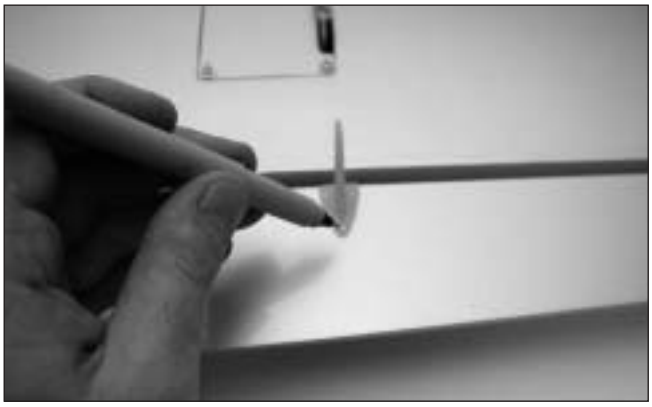


☐ ☐ **Step 3**

Remove the back plate from the control horn using side cutters or a sharp hobby knife. Use a 5/64" drill bit to drill out the mounting holes in the control horn.

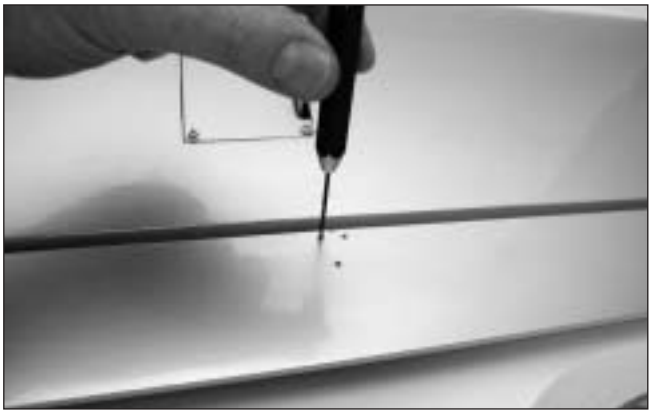
☐ ☐ **Step 4**

Position the control on the aileron by aligning the holes of the control horn with the hinge line of the aileron and center on the horn mounting plate (as marked back in Section 1). Use a felt-tipped pen to transfer the mounting holes from the control horn onto the aileron.



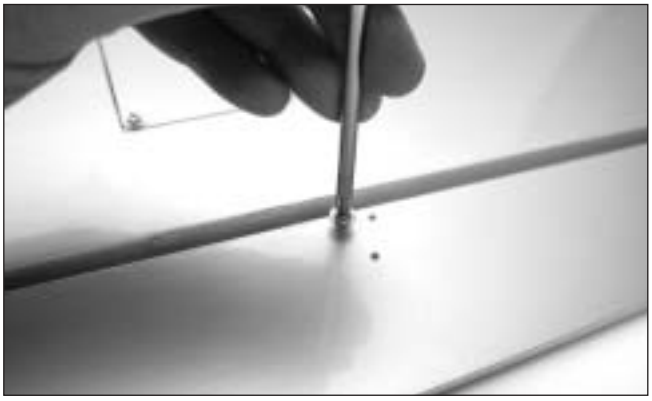
☐ ☐ **Step 5**

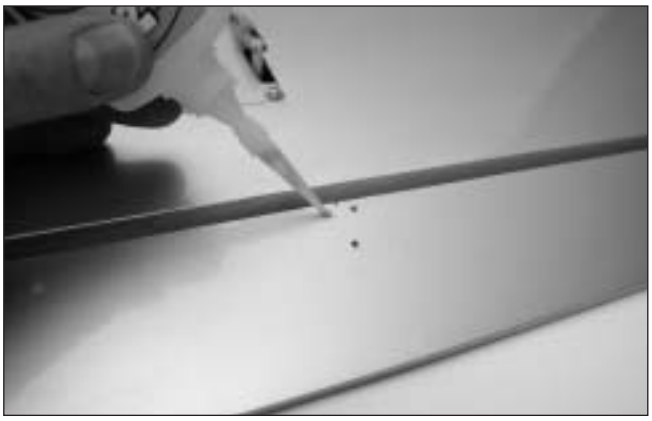
Drill three 1/16" holes at the locations marked in the previous step. The holes only need to be 5/16" deep; don't drill through the top of the aileron.



☐ ☐ **Step 6**

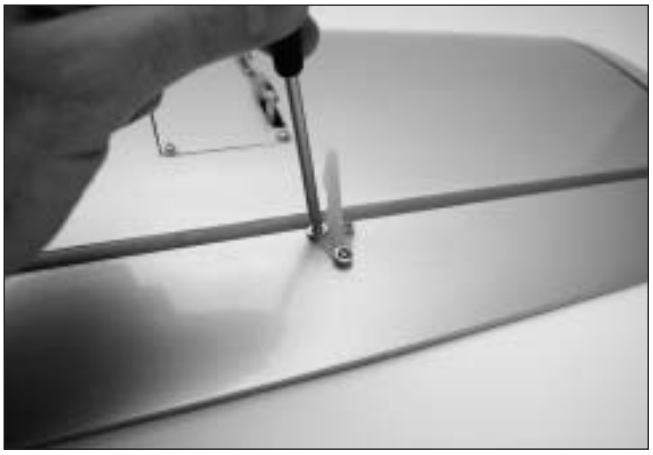
Install one of the #2 x 3/8" screws into a hole drilled, then remove it. Place 2-3 drops of thin CA into the hole to harden the wood. This will eliminate the potential of the screw pulling out of the wood. Repeat this for each of the three holes.





☐ ☐ **Step 7**

Attach the control horn using three #2 x 3/8" screws.



☐ ☐ **Step 8**

Attach the aileron control linkage to the aileron control horn.

Note: The linkage will be adjusted in Section 18: Radio Installation

☐ **Step 9**

Repeat Steps 1 through 8 for the remaining aileron servo linkage.

Section 4: Hinging the Flaps

Required Parts

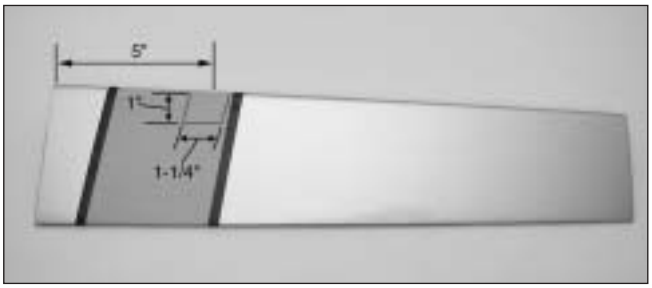
- Wing assembly
- Nylon flap hinges (6)

Required Tools and Adhesives

- 30-minute epoxy
- Paper towels
- Rubbing alcohol
- Petroleum jelly

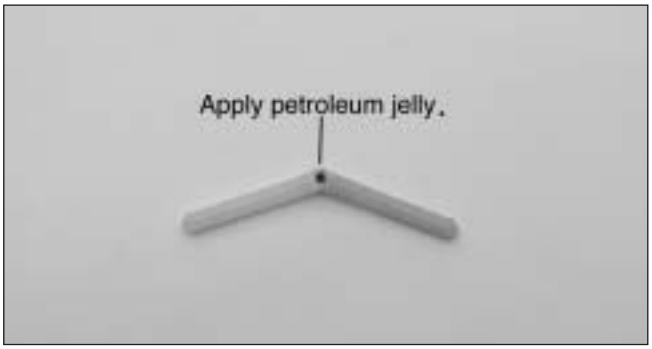
☐ ☐ **Step 1**

Carefully remove the tape holding the flap to the wing. Locate the hardwood control horn mount in the flap. The center of the mount is located 5" from the root of the flap (wide end). The plate is 1 $^1/_4$" wide and 1" deep.



☐ ☐ **Step 2**

Locate three of the nylon flap hinges. Apply a small amount of petroleum jelly to the hinge joint to prevent the epoxy from preventing movement of the hinge.



☐ ☐ **Step 3**

Locate the holes in the wing and flap for the flap hinges. Remove the covering if necessary from each hole. There will be a total of three holes each in the wing and flap.

☐ ☐ **Step 4**

Install the hinges in the flap and slide the flap into position. Check to make sure the flap aligns with both the aileron and wing trailing edge. If it does not, enlarge the first 1/4" of the hinge holes in both the wing and flap to provide more clearance for the center of the hinge. This will allow the flap to be positioned closer to the wing for alignment.

☐ ☐ **Step 5**

Use 30-minute epoxy to install the hinges. Apply epoxy to both the holes in the flap and wing using a toothpick. Apply a light coat of epoxy to the hinge. Slide the flap into position, and move it up and down to make sure the hinges are aligned. Use tape around the division between the flap and wing, as well as the flap and aileron, to hold the flap until the epoxy fully cures.

☐ **Step 6**

Repeat Steps 1 through 5 for the remaining flap.

Section 5: Flap Servo Installation

Required Parts

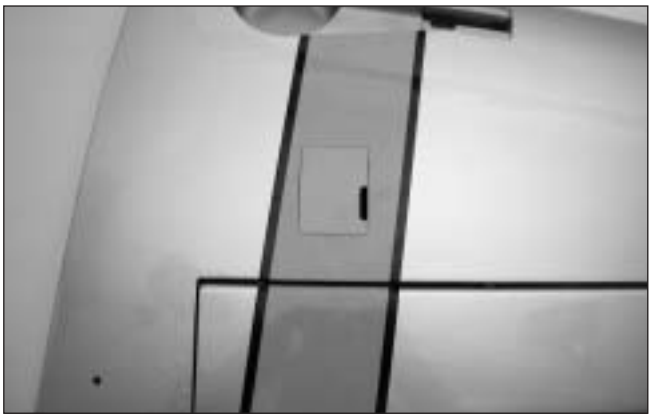
- Wing assembly
- Flap servos w/mounting hardware (2)
- Servo hatch screws (#2 x 3/8") (4)
- Large Servo Arm (JRPA212) (1 pkg)
- Servo mounting blocks (4)
- 6" Servo Lead Extension (JRPA094)
- Flap servo hatch (2)

Required Tools and Adhesives

- Thin CA
- Thick CA
- Phillips screwdriver
- Felt-tipped pen
- Drill Bit: 1/16", 5/64"
- Drill
- String/.dental floss

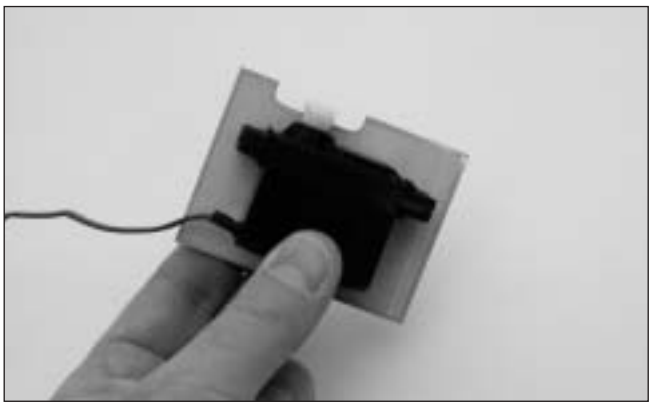
☐ ☐ **Step 1**

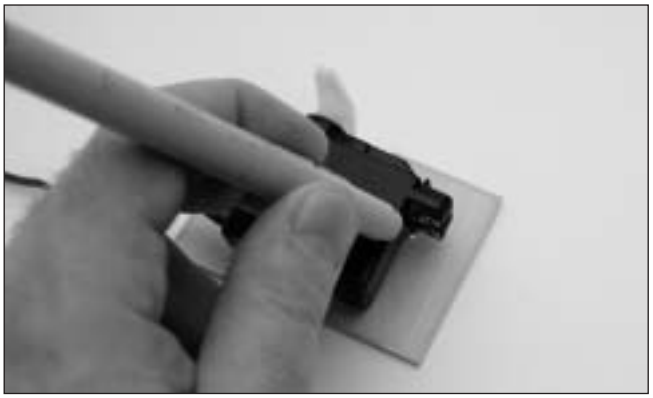
Locate the flap hatch. The slot for the flap horn is positioned towards the trailing edge of the wing, as well as towards the tip, as shown in the photo.



☐ ☐ **Step 2**

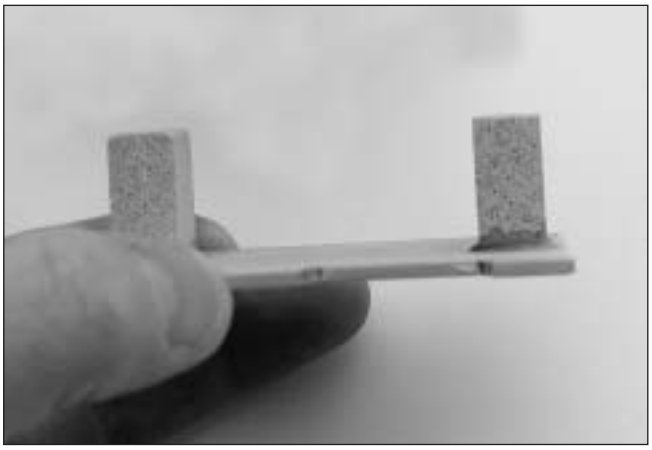
Install the recommended servo hardware (grommets and eyelets) supplied with the servo. Temporarily install a long half servo arm (JRPA212) onto the servo and position the servo onto the hatch so the servo arm is centered in the notch. Also ensure the servo arm does not extend past the edge of the servo hatch. Once satisfied, mark the location for the servo mounting blocks.





☐ ☐ **Step 3**

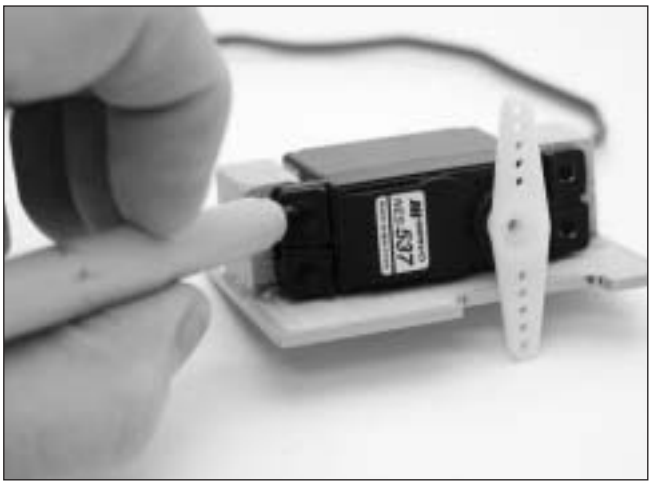
Locate the servo mounting blocks. Use 6-minute epoxyto glue them in place on the marks made in the previous step. Let the epoxy fully cure before proceeding to the next step.



☐ ☐ **Step 4**

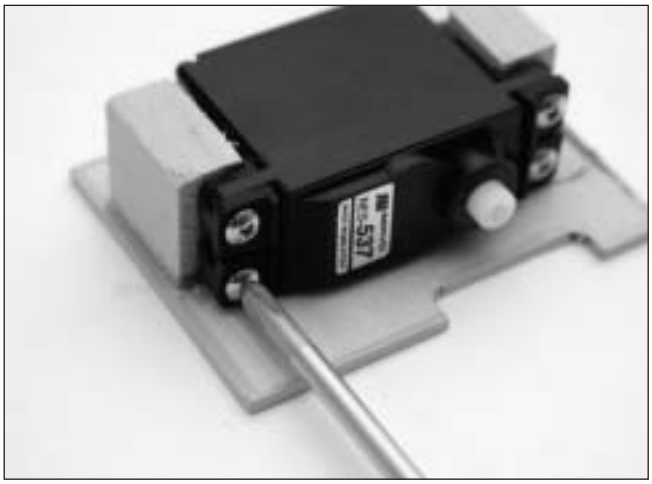
Place the flap servo between the mounting blocks and use a felt-tipped pen to mark the location of the four mounting screws.

> **Note**: The servo must not touch the hatch in order to isolate engine vibration.



☐ ☐ **Step 5**

Remove the servo and use a 1/16" drill bit to predrill the holes for the servo mounting screws marked in the pervious step. Use the screws supplied with the servo to mount it to the servo mounting blocks.



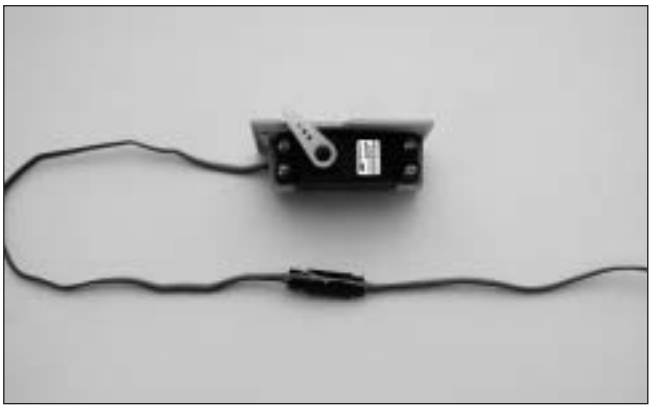
☐ ☐ **Step 6**

Before installing the servo arm, center the servo electronically using the transmitter. Install the servo arm so it is positioned towards the rear of the servo hatch (trailing edge) when the transmitter is in the “up flap” position. Check the movement of the servo, then install the servo arm screw.

Section 5: Flap Servo Installation

☐ ☐ **Step 7**

Connect a 6" Servo Lead extension (JRPA094) to the servo lead. Secure the connectors by tying them in a knot using dental floss (as shown) or by using a commercially available connector clamp to prevent the servo leads from becoming disconnected.



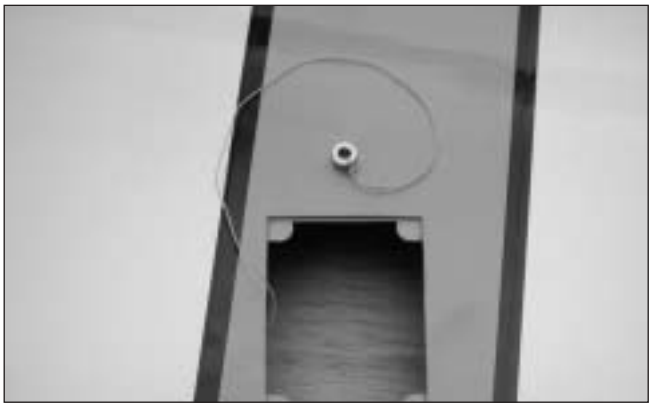
Note: It is always a good idea to secure the servo connector and servo extension together to prevent the wires from becoming unplugged inside the wing.

☐ ☐ **Step 8**

Use a piece of string with a small weight (such as a wheel collar) attached as a device to pull the servo lead through the wing. Lower the weight through the opening at the root of the wing as shown.

☐ ☐ **Step 9**

Stand the wing on the tip and allow the weight to drop through the wing until it appears in the opening for the servo leads. It may require a little help to pass by the wing ribs in the form of slightly shaking the wing.

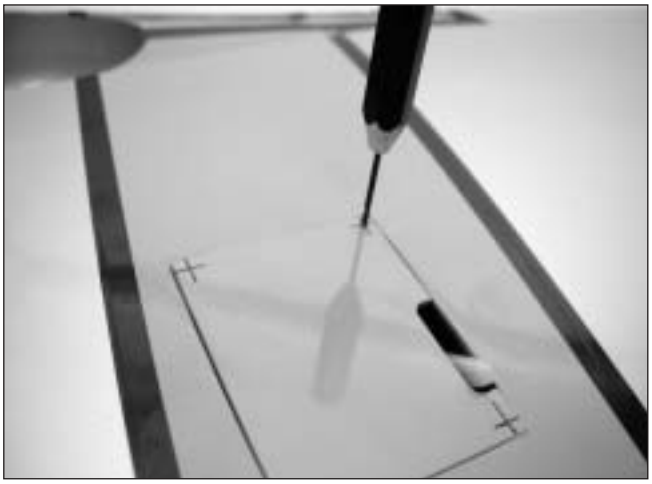


☐ ☐ **Step 10**

Tie the string onto the servo extension. Gently pull the extension through the wing using the string. Untie the string when the servo lead has been pulled through. Use tape to secure the servo lead to the wing to prevent it from falling back into the wing panel.

☐ ☐ **Step 11**

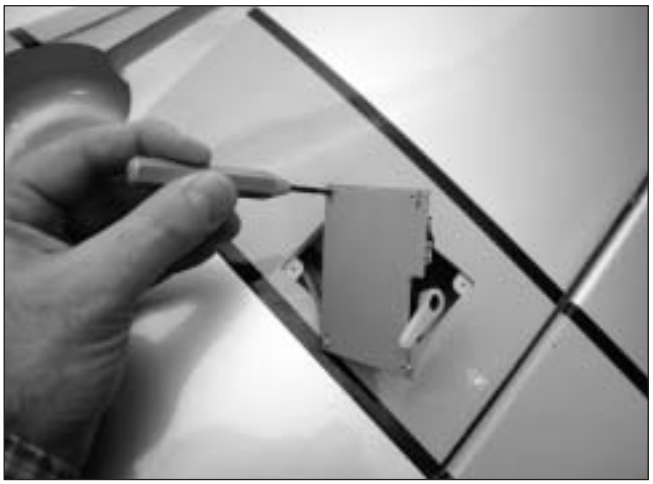
Place the hatch cover into position in the flap opening. Measure in 1/8" on all four sides of the hatch. Drill four 1/16” holes at the intersections of the lines as shown.

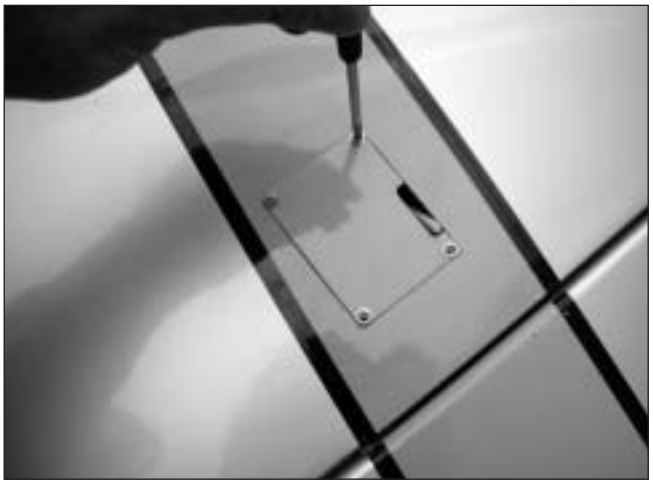


Note: Drill through the servo hatch and the underlying hatch mounts. Use caution not to accidentally drill through the top of the wing.

☐ ☐ **Step 12**

Remove the servo hatch cover and re-drill the holes using a 5/64" drill bit. Use 2–3 drops of thin CA to harden the underlying wood. This will prevent the screws from crushing the wood when they are tightened. Secure the hatch using four #2 x 3/8" screws.





☐ **Step 13**

Repeat Steps 1 through 12 for the remaining flap servo.

Section 6: Flap Linkages

Required Parts

- Wing assembly
- Mounting screws (6)
- Clevis keeper (4)
- Control horn (2)
- Metal clevis (4)
- 4-40 nuts (4)
- 4-40 x 1-1/2" threaded rod (2)
- #2 x 3/8” screws (6)

Required Tools and Adhesives

- Thin CA
- Drill Bit: 1/16", 5/64"
- Felt-tipped pen
- Phillips screwdriver
- Drill

☐ ☐ **Step 1**

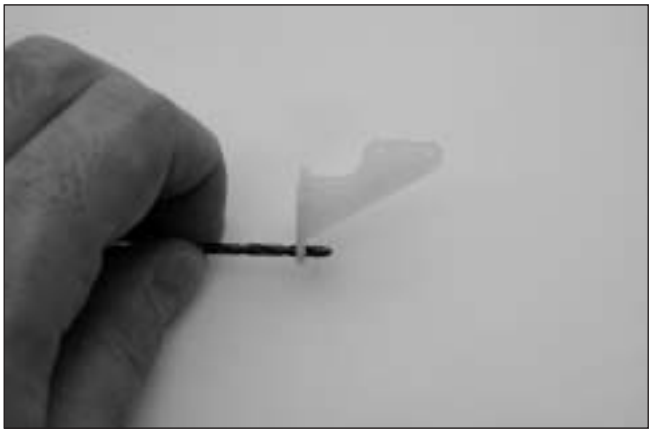
Prepare the flap linkage by placing the clevis keepers onto the metal clevises. Thread a 4-40 nut onto each end of the 4-40 x 1-1/2" threaded rod. Thread a clevis onto each end of the threaded rod. The threaded rod should just be visible between the forks of the clevis.

☐ ☐ **Step 2**

Attach the assembled linkage to the flap servo arm.

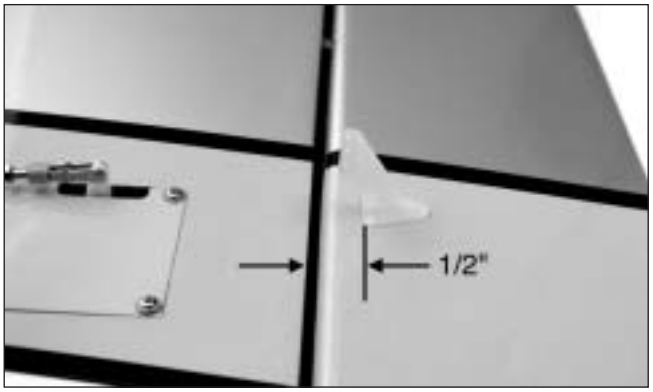
☐ ☐ **Step 3**

Remove the back plate from the control horn using side cutters or a sharp hobby knife. Use a 5/64" drill bit to drill out the mounting holes in the control horn.



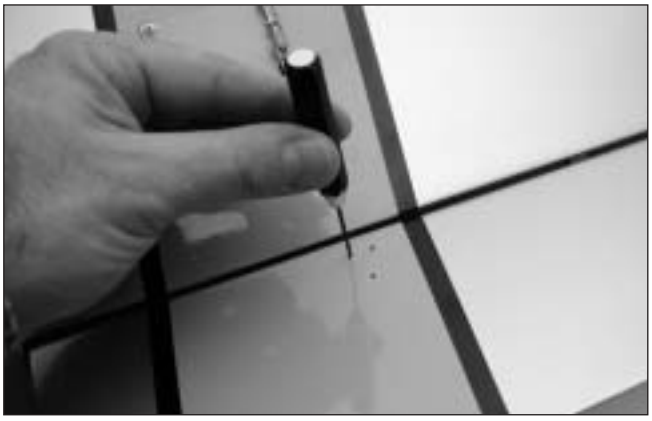
☐ ☐ **Step 4**

Position the control horn on the flap by: Aligning the front edge of the control horn 1/2" behind the trailing edge of the wing and in-line with the flap control linkage. Use a felt-tipped pen to transfer the mounting holes from the control horn onto the flap.



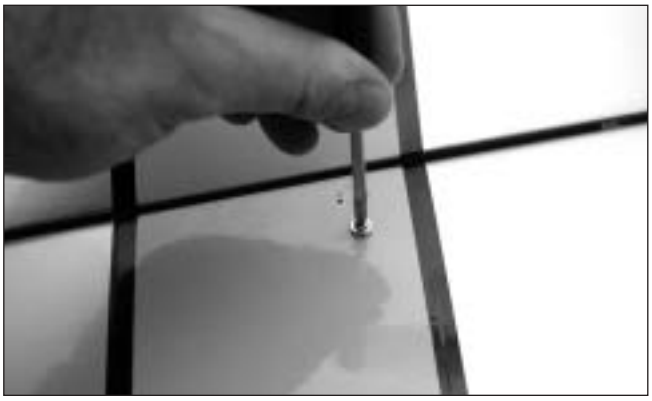
☐ ☐ **Step 5**

Drill three 1/16" holes at the locations marked in the previous step. The holes only need to be 5/16" deep; don't drill through the top of the flap.



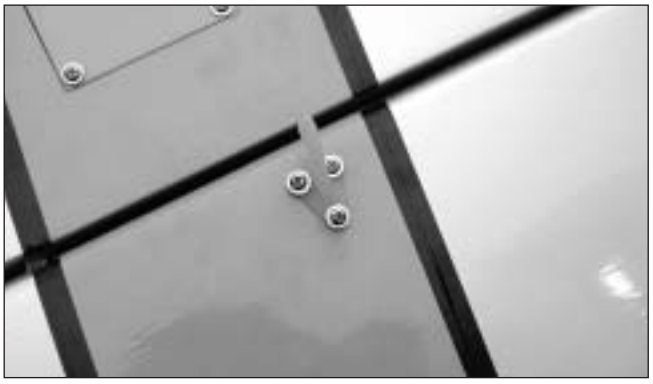
☐ ☐ **Step 6**

Install one of the #2 x 3/8" screws into a hole drilled, then remove it. Place 2–3 drops of thin CA into the hole to harden the wood. This will eliminate the potential of the screw pulling out of the wood. Repeat this for each of the three holes.



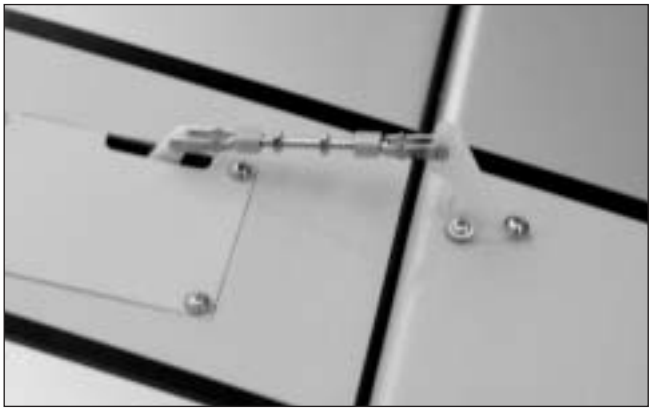
☐ ☐ **Step 7**

Attach the control horn using three #2 x 3/8" screws.



☐ ☐ **Step 8**

Attach the flap control linkage to the flap control horn.



Note: The linkage will be adjusted in Section 18: Radio Installation.

☐ **Step 9**

Repeat Steps 1 through 8 for the remaining flap servo linkage.

Section 7: Retract Servo Installation

Required Parts

- 4-40 x 10-1/2" threaded rod (2)
- Right and left wing panels
- Retract servo with hardware (2) (JRPS703)
- Easy connector (2)
- Connector back plate (2)
- 4-40 x 1/4" screw (2)
- Metal clevis (2)
- Clevis keeper (2)
- 4-40 nut (2)

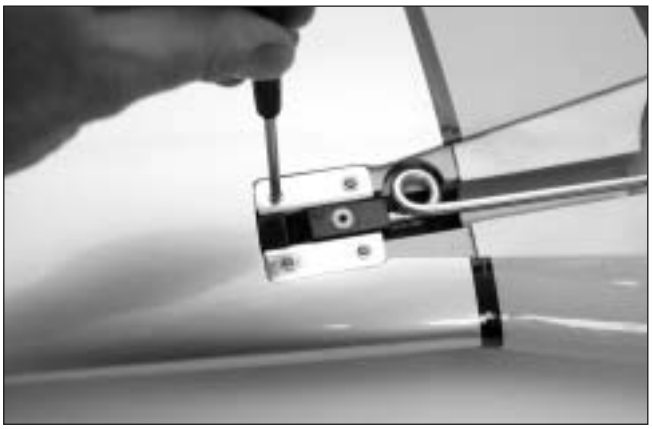
Required Tools and Adhesives

- Threadlocking compound
- Drill Bit: 1/16", 7/64"
- Drill
- Phillips screwdriver
- 3/32" hex wrench
- Hobby knife
- Side cutters
- Felt-tipped pen

Note: The retract mechanism for the P-51 comes preinstalled from Hangar 9®. The P-51 retract system is designed to use low-profile retract servos, such as the JRPS703.

☐ ☐ **Step 1**

Remove the retract from the wing by removing the four #2 x 3/8" screws that hold the retract in position.

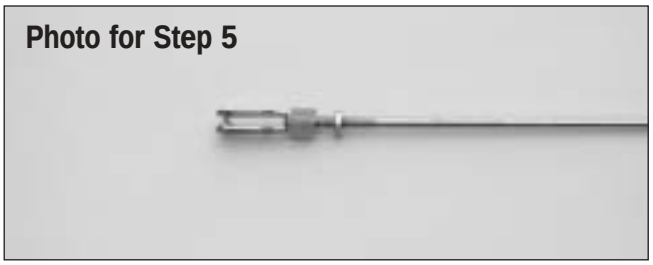


☐ ☐ **Step 2**

Prepare the retract linkage by threading a 4-40nut onto the shaft. Slide a clevis keeper onto the metal clevis, then thread the clevis onto the 4-40 x 10 $^1/_2$" threaded rod.

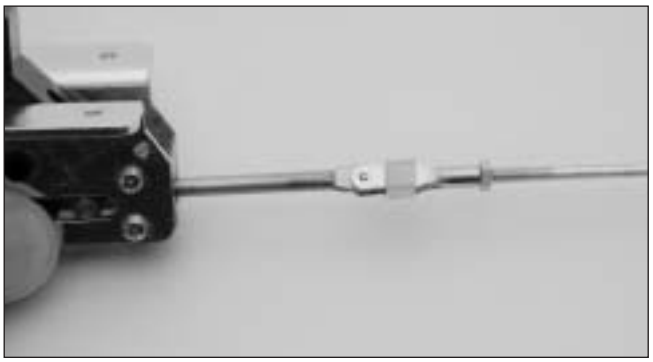
The threads of the threaded rod should be visible between the forks of the clevis.

Photo for Step 5



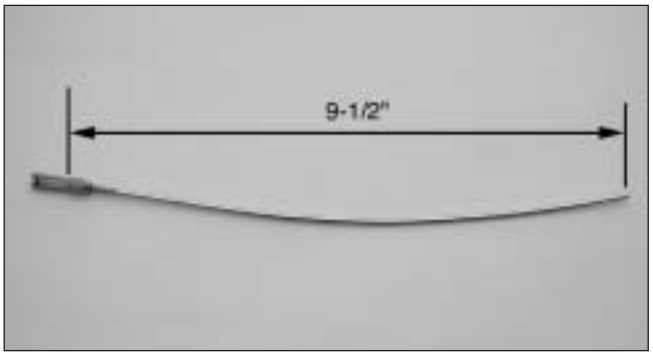
☐ ☐ **Step 3**

Connect the clevis to the retract actuator lever. Slide the clevis keeper onto the clevis to prevent the clevis from opening up during flight. Apply a small amount of threadlocking compound behind the clevis, then tighten the nut against the clevis. This will prevent the threaded rod from rotating in the clevis, which could lead to failure in flight.



☐ ☐ **Step 4**

Cut the threaded rod to a length of 9 $^1/_2$". Make a slight bend as shown in the photo to make the installation of the retract in the next step easier.



☐ ☐ **Step 5**

Re-install the retract back into the wing. Guide the retract pushrod through the wing and into the opening for the retract servo. Secure the retract using the screws removed in Step 1.

☐ ☐ **Step 6**

Install the servo mounting hardware included with your retract servo, (rubber grommets and eyelets). With the servo wheel removed, install the servo as shown, with the output shaft towards the root of the wing.

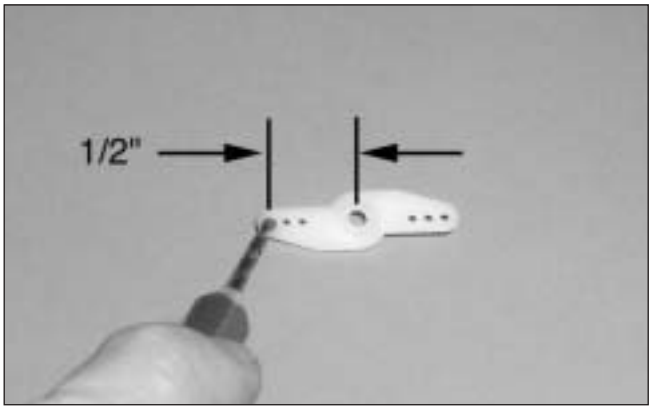
☐ ☐ **Step 7**

With the servo in place, use a 1/16" drill bit to drill the pilot holes for the servo mounting screws. Secure the retract servo using the screws supplied with the servo.

> **Caution**: Drill only deep enough for the mounting screws. If you drill too deep, the bit will come out through the bottom of the wing.

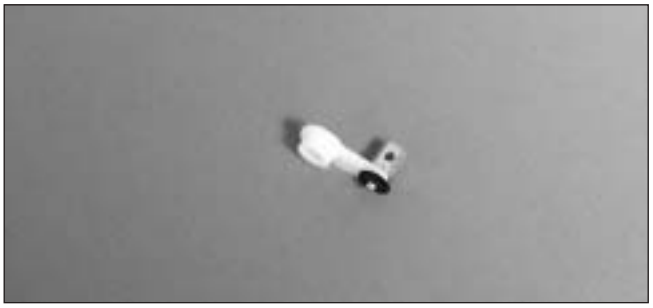
☐ ☐ **Step 8**

Using a ruler, locate a hole in the servo arm that is 1/2" away from the center on the arm. Drill the hole larger using a 7/64" drill bit.



☐ ☐ **Step 9**

Locate an easy connecter and an easy connector back plate. Install the connector in the hole drilled in the previous step. Secure the connector position using the connector back plate.



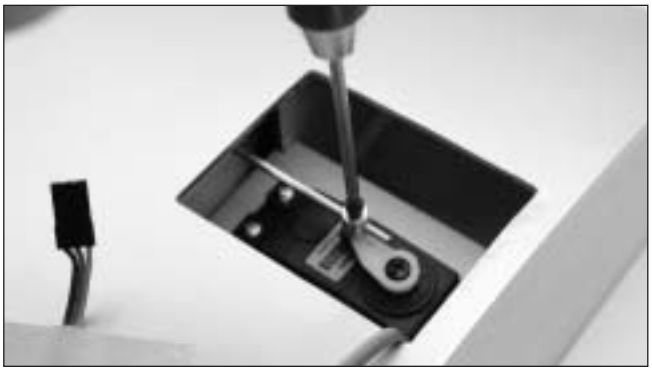
☐ ☐ **Step 10**

Connect the retract servo to your radio system and electronically move the servo to the retracted position. Slide the retract control wire through the easy connector as shown and secure the servo wheel to the retract servo.

Section 7: Retract Servo Installation

☐ ☐ **Step 11**

With the retract servo in the retracted position, push the retract linkage to manually retract the landing gear. Install a 4-40 x 1/4" screw into the easy connector and tighten it to secure the retract linkage.



☐ ☐ **Step 12**

Cycle the retract system several times to make sure there is no binding. Also check to verify the gear locks in both the extended and retracted positions. Make any necessary adjustments to be sure the retracts are working and locking correctly.

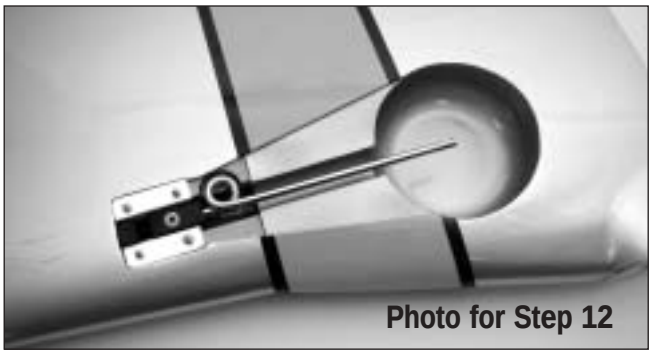


Photo for Step 12

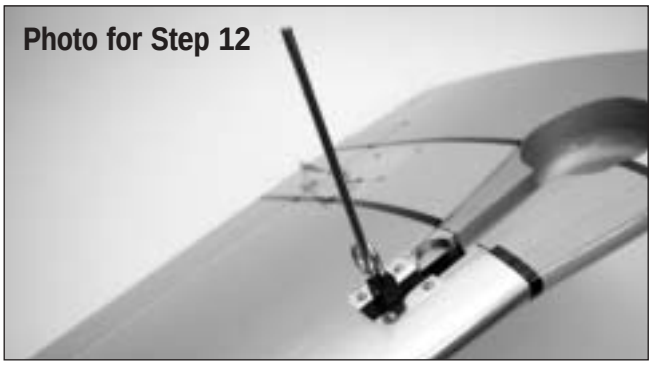


Photo for Step 12

☐ **Step 13**

Repeat Steps 1 through 12 for the remaining retract.

Section 8: Main Landing Gear and Wheel Doors

Required Parts

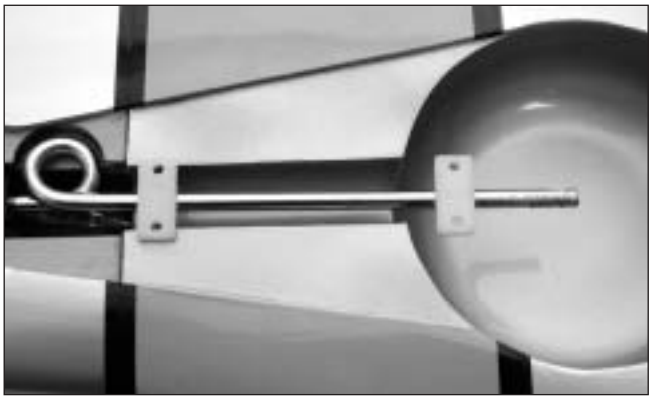
- Wing assembly
- Landing gear door (2)
- Wheel collars (4)
- M3 x 8 screw (4)
- Axle mounts (2)
- Axles (2)
- 6-32 set screw (2)
- 8-32 set screw (2)
- #4 x 7/16" screws (8)
- Main landing gear wheels (2)
- Landing gear door mounts (2)

Required Tools

- Felt-tipped pen
- Phillips screwdriver
- Drill Bit: 1/8"
- Drill
- Moto-tool w/cut-off wheel
- Threadlocking compound

☐ ☐ **Step 1**

Slide the two landing gear door mounts onto the landing gear strut. The position of the mounts will be determined later.



☐ ☐ **Step 2**

Slide the axle mount onto the landing gear strut. Apply a drop of thread locking compound onto a 6-32 set screw. Secure the axle mount using the 6-32 set screw, making sure to tighten the screw onto the flat spot on the strut.

☐ ☐ **Step 3**

File a flat spot onto the axle. Slide the axle into the axle mount. Apply a drop of thread locking compound onto an 8-32 set screw. Use the set screw to secure the axle. Make sure to tighten the set screw onto the flat spot.

☐ ☐ **Step 4**

Slide a wheel collar onto the axle. Position the wheel collar against the axle mount, and then secure its location using an M3 x 8 screw.

☐ ☐ **Step 5**

Slide the wheel onto the axle. Make sure the wheel can rotate freely on the axle. Slide another wheel collar onto the axle and use an M3 x 8 screw to finish up the step. Remember to file a flat spot on the axle, as well as use threadlocking compound.

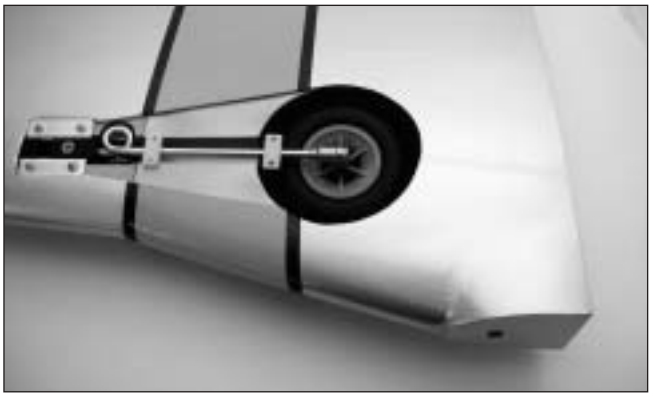
☐ ☐ **Step 6**

Remove the excess axle beyond the wheel collar using a Moto-tool w/cut-off wheel

Section 8: Main Landing Gear and Wheel Fairings

☐ ☐ **Step 7**

Check the fit of the wheel in the wheel well when the gear is retracted. Make any necessary adjustments so the wheel does not rub the wheel well when the gear is retracted or extended.

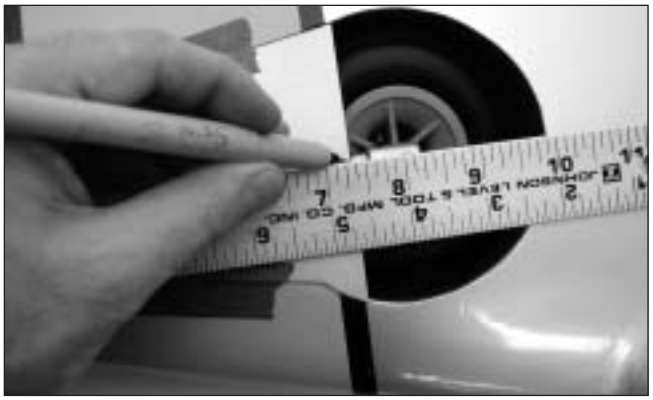


☐ ☐ **Step 8**

Locate the correct landing gear door tape it into position. The correct door will fit the contour of the airfoil and have a small protrusion towards the leading edge of the wing.

☐ ☐ **Step 9**

Draw two small marks on the landing gear door that will indicate the location of the landing gear strut. Mark the landing gear where the lower edge of the landing gear door will be positioned.



☐ ☐ **Step 10**

Remove the landing gear door and draw a line connecting the two marks on the back of the door.

☐ ☐ **Step 11**

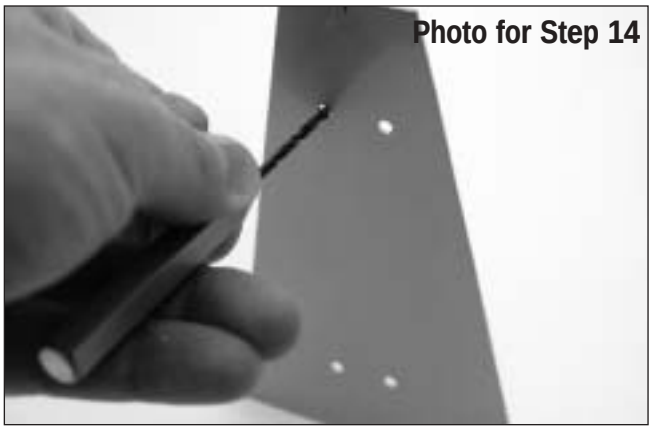
Position the gear door mounts as follows: Position mount near the wheel so it is almost touching the wheel well. Position the mount near the retract mechanism slightly below the wheel well.

☐ ☐ **Step 12**

Extend the retract. Position the landing gear door so the centerline and lower edge marks are aligned. Mark the screw locations for the landing gear door mount screws.

☐ ☐ **Step 14**

Drill the locations marked in the previous step using a 1/8" drill bit.

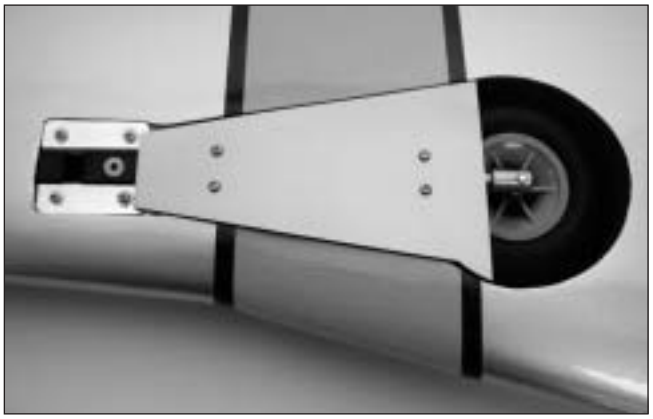


☐ ☐ **Step 15**

Secure the landing gear door to the mounting brackets using four #4 x 7/16" screws.

☐ ☐ **Step 16**

Move the landing gear to the retracted position. Check the fit of the landing gear door and make any adjustments to provide a perfect fit.



Section 8: Main Landing Gear and Wheel Fairings

☐ ☐ **Step 17**

Once the landing gear door has been adjusted, move the retracts to the extended position. Apply a few drops of thin CA to the mounts to lock in their positions on the landing gear strut.

☐ ☐ **Step 18**

Apply a few drops of thick CA to the screws to prevent them from loosening during flight. You may also want to trim off the excess screw for a cleaner look.

☐ **Step 19**

Repeat Steps 1 through 18 for the remaining retract.

Section 9: Joining the Wing

Required Parts

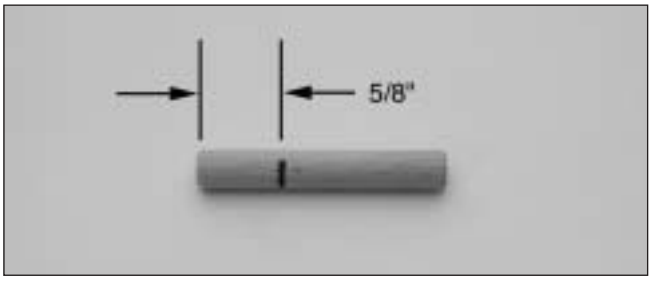
- Wing assembly
- Wing joiner
- Wing dowels (2)

Required Tools and Adhesives

- Ruler
- Masking Tape
- 5-minute epoxy
- 30-minute epoxy
- Rubbing alcohol
- Paper towels

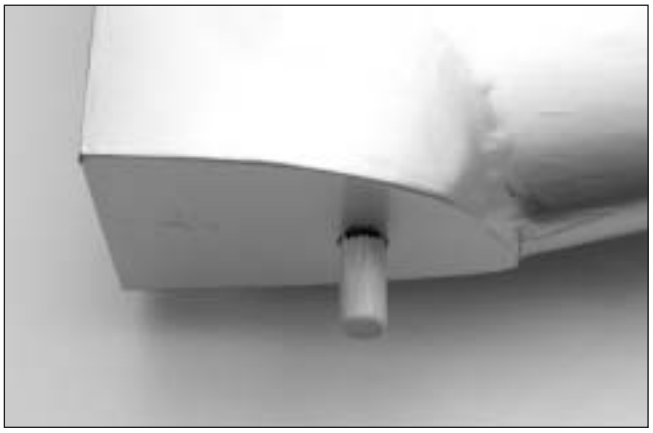
☐ **Step 1**

Locate the two 1/4" x 2" wing dowels. Draw a line 5/8" from one end on each dowel.



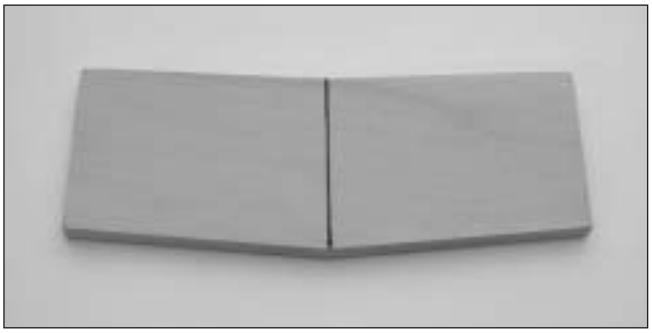
☐ **Step 2**

Glue the dowel into the wing using 5-minute epoxy. Apply epoxy to both the holes in the wing and dowels. Slide the dowels in up to the line drawn in the previous step. Clean up any excess epoxy using a paper towel and rubbing alcohol. Allow the epoxy to fully cure before proceeding.



☐ **Step 3**

Locate the wing joiner and mark a centerline on the joiner.



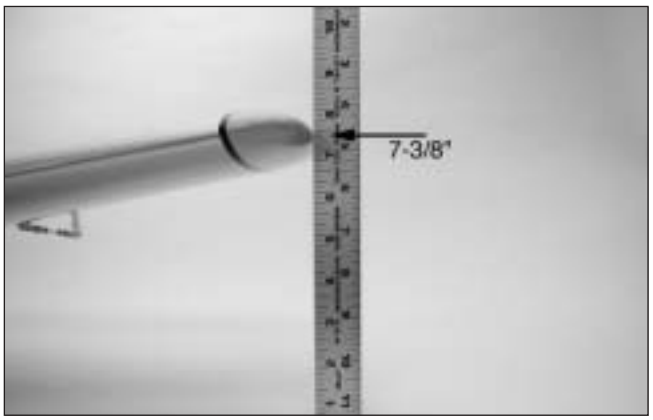
☐ **Step 4**

Without using any glue, test the fit of the wing panels and wing joiner. The panels must fit together without any gaps, top or bottom. If any gaps do exist, use a sanding bar to lightly sand the root ribs of both panels until the panels fit together perfectly.

☐ **Step 5**

With the wing panels together, check for correct dihedral. Place the wing on a large flat surface with one panel resting flat on the surface. The opposite wing tip should be 7 $^{3}/_{8}$" from the work surface.

Once satisfied with the fit, separate the wing panels and remove the wing joiner.



Note: Read through the remaining steps of this section before mixing any epoxy.

Hint: It is extremely important to use plenty of epoxy when joining the wing panels. It will also be helpful to use wax paper under the wing joint to avoid gluing the wing to your work surface.

☐ **Step 6**

Mix approximately 1 ounce of 30-minute epoxy. Using an epoxy brush, apply a generous amount of epoxy to the wing joiner cavity of one wing panel.

Section 9: Joining the Wing

☐ **Step 7**

Completely coat one half of the wing joiner with epoxy up to the line drawn in Step 1. Be sure to apply epoxy to the top and bottom of the joiner also. Insert the epoxy coated side of the joiner into the wing joiner cavity up to the mark on the joiner. If you have used enough epoxy, it will ooze out of the cavity as the joiner is installed.

☐ **Step 8**

Apply a generous amount of epoxy to the joiner cavity of the opposite wing panel.

☐ **Step 9**

Apply epoxy to the exposed portion of the wing joiner.

☐ **Step 10**

Apply epoxy to root wing rib of both panels.

☐ **Step 11**

Carefully slide the wing panels together. Apply enough pressure to firmly seat the two wing panels together, causing any excess epoxy to ooze out from between the panels. Use rubbing alcohol and a paper towel to remove the excess epoxy. Check to make sure there are no visible gaps between the panels.

☐ **Step 12**

Use masking tape to securely hold the wing panels together. Place the wing assembly back onto the work surface (covered with wax paper) and check the dihedral angle. Allow the epoxy to fully cure before continuing to the next section.

Section 10: Mounting the Wing to the Fuselage

Required Parts

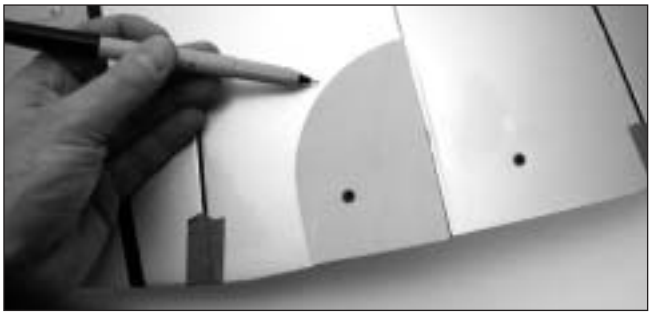
- Assembled wing
- Fuselage
- Plywood wing bolt plate (2)
- 1/4-20 x 2" nylon bolts (2)

Required Tools and Adhesives

- 6-minute epoxy
- Screwdriver (slotted)
- Hobby knife
- Felt-tipped pen

☐ ☐ **Step 1**

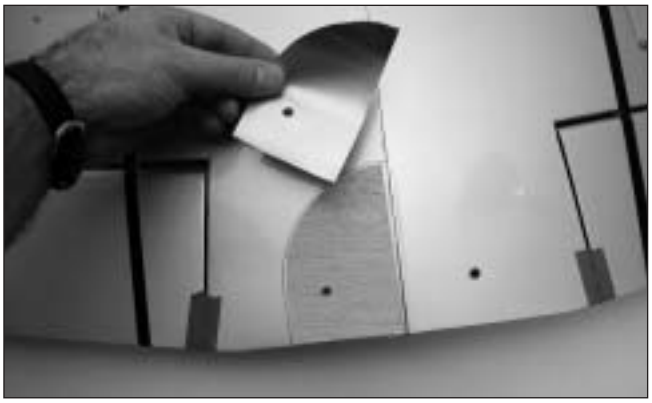
Locate the plywood wing bolt plate. Align the plate along the centerline of the wing and trailing edge. Trace around the plate using a felt-tipped pen.



Hint: The hole in the wing and hole in the plate should line up when positioned correctly.

☐ ☐ **Step 2**

Use a hobby knife with a brand new blade to remove the covering 1/16" inside of the line drawn. Use care not to cut into the underlying balsa, as this will weaken the wing structure.



☐ ☐ **Step 3**

Mix 1/2 ounce of 6-minute epoxy and coat both the wing and plywood plate. Align the plate back onto the wing and clamp it in position. Remove any excess epoxy using paper towels and rubbing alcohol.

Caution: Use scrap plywood under the clamps to prevent damage to the balsa wing structure.

☐ **Step 4**

Once the epoxy has fully cured, repeat Steps 1 through 3 for the remaining wing bolt plate.

☐ **Step 5**

Place the wing onto the fuselage, and check the fit. Make any adjustments necessary to the wing bolt holes and attach the wing using the two 1/4-20 x 2" nylon bolts.

Section 11: Lower Air Intake Installation

Required Parts

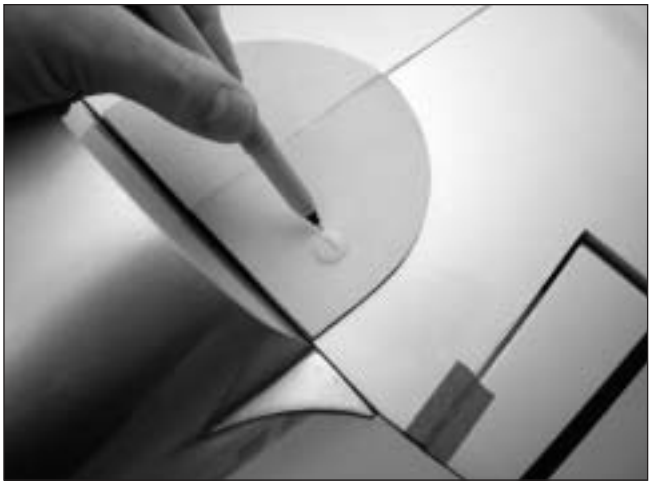
- Air scoop
- Plastic guide tubes (2)
- Plywood tube locators (2)

Required Tools and Adhesives

- Medium CA
- Thick CA
- Razor saw
- Hobby knife
- Felt-tipped pen
- Medium grit sandpaper

☐ **Step 1**

Use a felt-tipped pen to trace around the heads of the wing bolts.

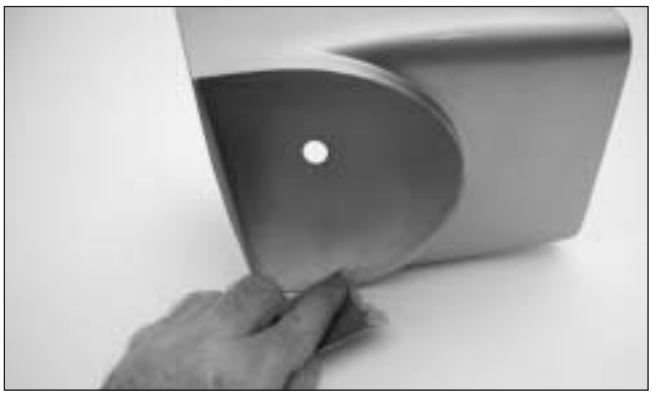


☐ **Step 2**

Remove the wing bolts from the wing. Locate the plywood tube locators and use medium CA to glue the locators in position. Use the lines drawn around the bolt heads as a guide.

☐ **Step 3**

Place a piece of wax paper between the fuselage and wing, then bolt the wing onto the fuselage.



☐ **Step 4**

Use medium grit sandpaper to lightly sand the inside edge of the air scoop.

☐ **Step 5**

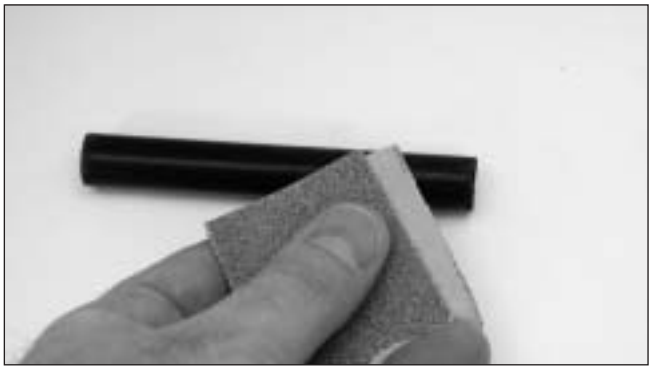
Position the air scoop onto the wing bolt plates. It should fit snug onto the plates. Remove the air scoop, and apply a thin bead of medium CA around the bottom edge of the air scoop. Place it back into position and allow the CA to cure before proceeding.

☐ **Step 6**

Remove the wing from the fuselage.Try to keep the wing bolts in the wing. Once the wing is removed, slide the plastic guide tubes through the scoop and over the heads of the wing bolts. The ends of the tubes will lock into the plywood tube locators when fully installed.

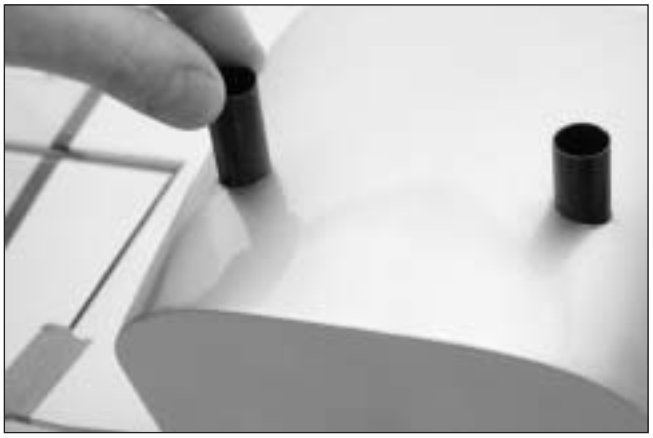
☐ **Step 7**

Remove the wing bolts from the plane by sliding them out through the tubes. Remove the tubes and roughen them using medium sandpaper.



☐ **Step 8**

Apply a thin bead of thick CA around one end of the tubes. Slide the tube in position through the air scoop and into the plywood tube locators. Use a paper towel to clean up any excess CA from the air scoop.



Section 11: Lower Air Intake Installation

☐ **Step 9**

Remove the excess tube using a razor saw and hobby knife.

Section 12: Stabilizer Installation

Required Parts

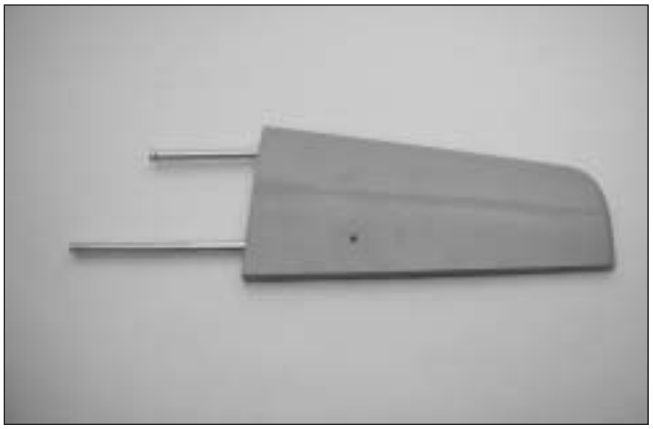
- Fuselage
- Stabilizer (right and left)
- Stabilizer tube (short)
- Stabilizer tube (long)
- #2 x 3/8" screw (2)

Required Tools

- Drill Bit: 3/32"
- Drill
- Phillips screwdriver

☐ **Step 1**

Locate both of the stabilizer tubes, short and long. Slide the tubes into one half of the stabilizer as follows: short tube towards the leading edge and the long tube towards the trailing edge.

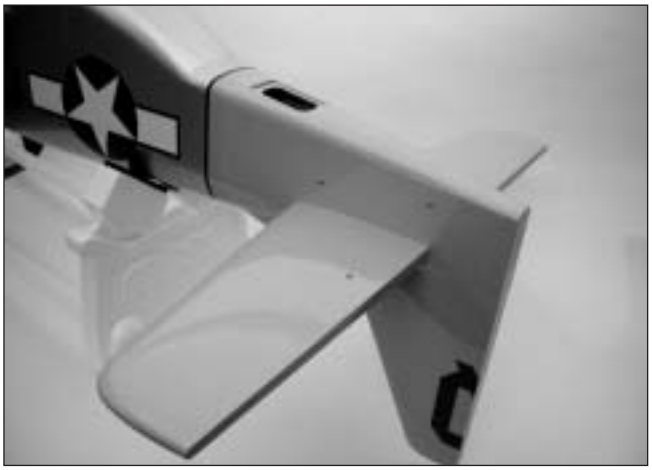


☐ **Step 2**

Slide the tubes into the fuselage. The hole in the stabilizer faces the bottom of the plane.

☐ **Step 3**

Slide the remaining stabilizer half onto the tubes.

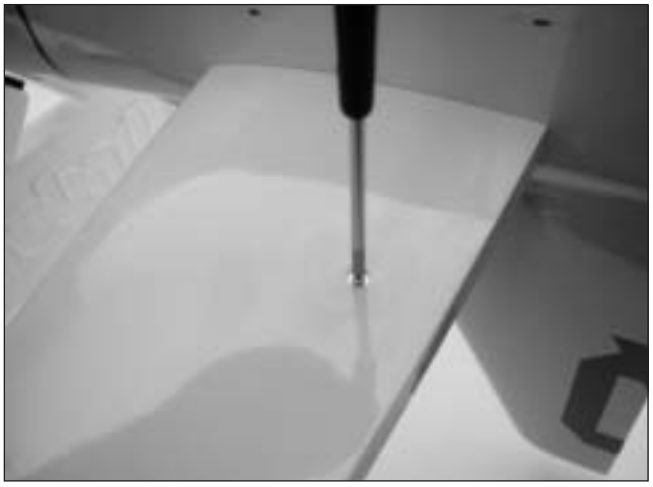


☐ ☐ **Step 4**

Use a 3/32" drill bit to drill through the hole in the stabilizer into the stabilizer tube. Be very careful to only drill through the tube, not through the top of the stabilizer.

☐ ☐ **Step 5**

Secure the tube in the one stab half using a #2 x 3/8" screw.



☐ **Step 6**

Repeat Steps 4 and 5 for the remaining stab half.

Section 13: Hinging the Elevators

Required Parts

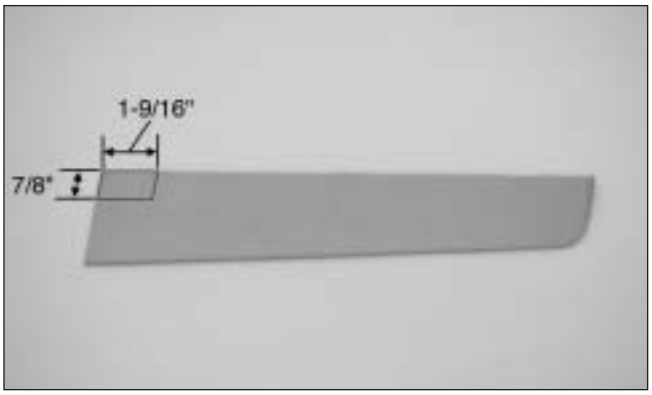
- Stabilizer
- Elevator (right and left)
- CA hinges (6)

Required Tools and Adhesives

- T-Pins
- Thin CA
- Paper towels
- CA remover/debonder

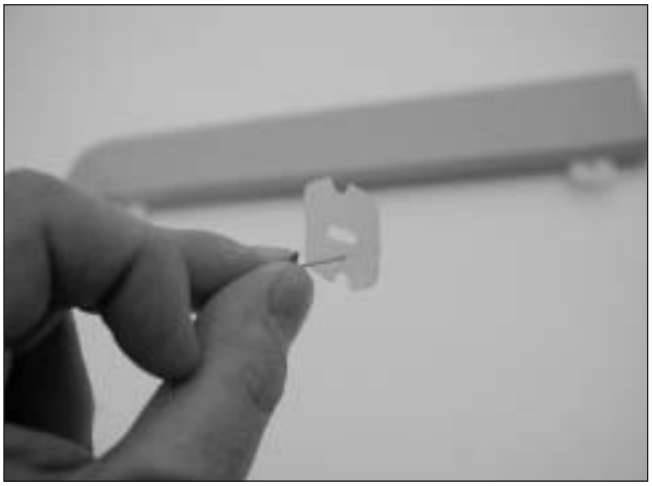
☐ ☐ **Step 1**

Locate the hardwood control horn mount in the elevator. The mount is located at the root end, and is 1 $^{9}/_{16}$" long and 7/8" wide. This plate must be located towards the bottom of the plane.



☐ ☐ **Step 2**

Locate three of the large CA hinges and place a T-pin in the center of the hinge as shown. Slide each of the three hinges into the elevator so the T-pin is resting against the leading edge of the elevator.



☐ ☐ **Step 3**

Slide the elevator onto the stabilizer until there is only a slight gap between the stabilizer and elevator. Remove the T-pins and snug the elevator against the stabilizer. Position the elevator so the tip aligns with the tip of the stabilizer.

Note: Do not use CA accelerator during the hinging process. The CA must be allowed to soak into the hinge to provide the best bond. Using accelerator will not provide enough time for this process.

☐ ☐ **Step 4**

Deflect the elevator and apply thin CA to the hinge. Apply enough CA to completely saturate the hinge. Use carenot to deflect the elevator so it pulls away from the stabilizer. When the hinge is glued in place, there should be no more than a 1/32" hinge gap maintained throughout the length of the elevator.

☐ ☐ **Step 5**

Turn the fuselage over, deflect the elevator in the opposite direction, and apply thin CA to the other side of the hinges as described in the previous step. Make sure the thin CA penetrates completely into both the elevator and stabilizer.

☐ ☐ **Step 6**

Use CA remover/debonder and a paper towel to remove any excess CA accumulated on the stabilizer or elevator surface. Allow time for the CA to completely cure before moving to the next step.

☐ ☐ **Step 7**

Firmly grasp the elevator and stabilizer and gently pull them apart to ensure the hinges are secure and cannot be pulled apart. Use caution when gripping them to avoid crushing the structure.

☐ ☐ **Step 8**

Work the elevator up and down several times to work in the hinges and check for proper movement.

☐ **Step 9**

Repeat Steps 1 through 8 for the remaining elevator.

Section 14: Hinging the Rudder

Required Parts

- Fuselage assembly
- Rudder
- CA hinges (3)

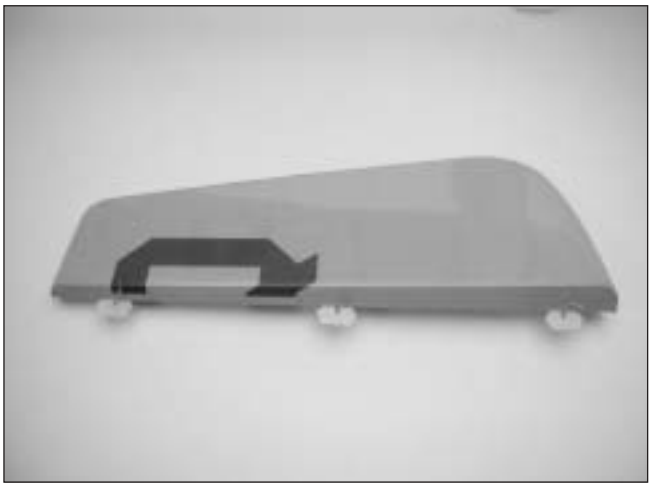
Required Tools and Adhesives

- T-Pins
- Thin CA
- Paper towels
- CA remover/debonder

Note: Hinging the rudder follows the same procedure as hinging the ailerons and elevators. We'll save you some reading and condense this into just a few steps.

Step 1

Locate three CA hinges and place a T-pin in the center of each hinge. Slide the hinges into the rudder.



☐ **Step 2**

Slide the rudder onto the fin. Align the top of the rudder with the top of the fin. Remove the T-pins and use thin CA to glue the hinges into position. Apply CA to both sides of the hinges.

☐ **Step 3**

Clean up any excess CA using CA remover/debonder. Once the CA has fully cured, gently pull on the rudder to ensure the hinges are secure. Flex the rudder a few times to work in the hinges.

Section 15: Tail Wheel Installation

Required Parts

- Pushrod wire (33-5/8" long)
- Nylon clevis
- Clevis keeper
- Wheel collar (2)
- M3 x 8 screw
- #2 x 3/8" screw (4)
- Tail wheel
- Wire tail gear
- Tail gear steering arm
- Tail wheel

Required Tools and Adhesives

- Pliers
- 1.5mm hex wrench
- Drill Bit: #20
- Drill
- File
- Side cutters
- Threadlocking compound

☐ **Step 1**

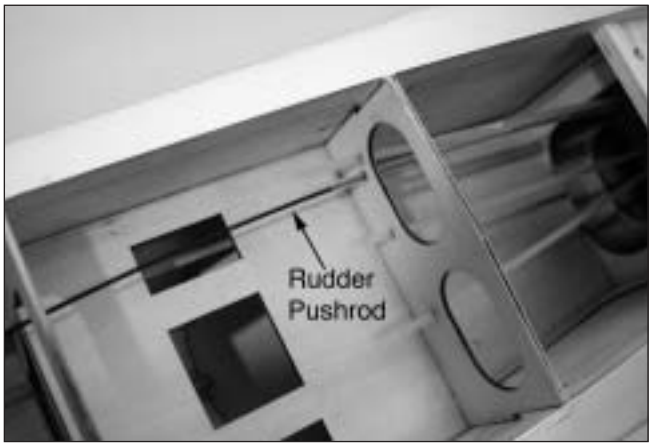
Locate the tail wheel. Carefully drill the hole for the axle using a #20 drill.

☐ **Step 2**

File a flat spot on the tail gear wire. Position the flat off-center slightly as shown in the photo.

☐ **Step 3**

Install the 33 $^{5}/_{8}$" pushrod wire into the pushrod tube shown. Make sure the threaded end is installed first, leaving the non-threaded end inside the radio area.



Hint: Install the pushrod wire through the hole in the firewall to avoid bending the wire.

Section 15: Tail Wheel Installation

☐ **Step 4**

Slide a clevis keeper onto a nylon clevis. Thread the clevis onto the wire a minimum of 10 turns.

☐ **Step 5**

Locate the tail gear steering arm. Use side cutters to remove the outermost hole from the arm.

☐ **Step 6**

Attach the clevis to the steering arm in the outer hole as shown. Slide the clevis keeper onto the clevis to keep the clevis from opening during flight.

☐ **Step 7**

Position the steering arm in the center of the pre-installed tail gear mount. Make sure the set screw in the arm is facing forward.

☐ **Step 8**

Slide the tail gear wire through the mount and steering arm. Position the wire so there is 1/2" between the top of the mount and the first bend in the wire. Tighten the set screw in the arm.

☐ **Step 9**

Slide a wheel collar onto the tail gear wire, then the tail wheel. Finally, slide another wheel collar on, and use an M3 x 8 screw to secure the outer collar. Use a little threadlocking compound on the screw to prevent it from vibrating loose in flight.

☐ **Step 10**

Secure the tail gear door cover using four #2 x 3/8" screws.

Section 16: Fuel Tank Assembly

Required Parts

- Clunk (fuel pickup)
- Fuel pickup tubing
- Rubber stopper
- Metal tubes (short and long)
- Metal caps (2)
- Fuel tank
- M3 x 20 screw

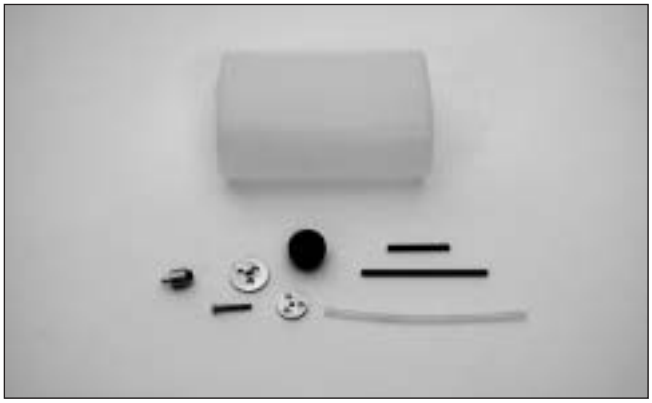
Required Tools and Adhesives

- Hobby knife
- Phillips screwdriver

Note: The stopper provided with the P-51 has three holes that are not bored completely through the stopper. The holes are for the fuel pickup, fill, and vent lines. For these instructions only two holes will be used: one for the fuel pickup and one for the fuel vent. Only open the third hole if you are going to use a separate fill line.

☐ **Step 1**

Locate the fuel tank parts.



Section 16: Fuel Tank Assembly

☐ **Step 2**

Locate the rubber stopper. Insert the shorter metal fuel tube into one of the holes in the stopper so that an equal amount of tube extends from each side of the stopper. This tube will be the fuel tank pickup that provides fuel to the engine.

☐ **Step 3**

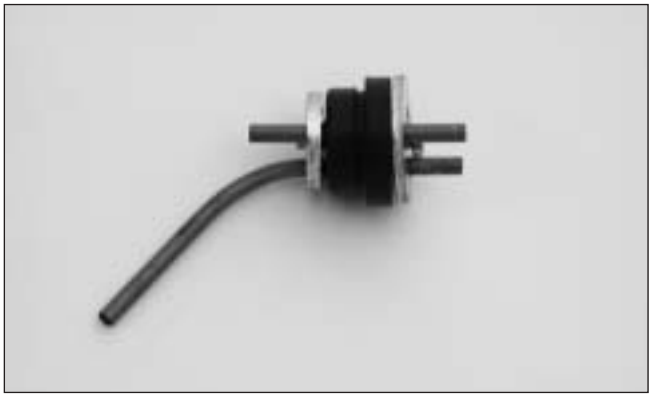
Slide the smaller cap over the tube on the smaller end of the rubber stopper. This end will be inserted into the fuel tank. The larger cap is placed on the side of the rubber stopper that makes the cap. Loosely install the M3 x 20 screw through the center of the stopper.

☐ **Step 4**

Bend the longer fuel tube carefully to a 45-degree angle using your fingers. This will be the fuel tank vent tube. Use care not to kink the tube while bending.

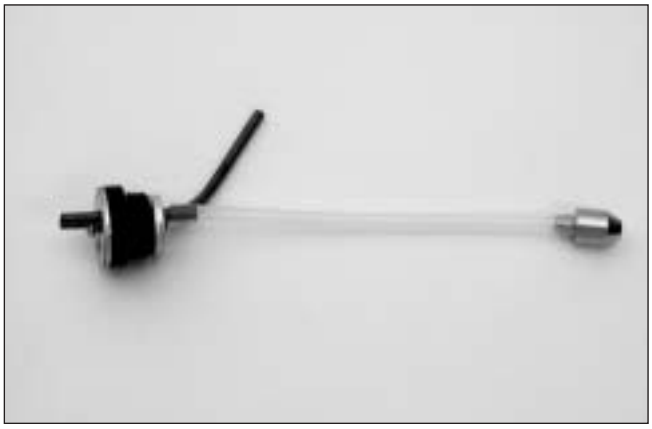
☐ **Step 5**

Slide the vent tube into on of the remaining two holes in the stopper from the tank (small cap) side.



☐ **Step 6**

Locate the short piece of silicone fuel tubing and the fuel tank clunk. Install the clunk onto one end of the silicone tubing. Slide the silicone tubing (end opposite the clunk) onto the fuel tank pickup tube (straight tube) in the stopper.



☐ **Step 7**

Carefully insert the stopper assembly into the fuel tank. Note the position of the vent tube; it must be up at the top portion of the fuel tank to function properly. Also, it may be necessary to shorten the length of the fuel pickup tubing to make sure the clunk does not rub against the back of the fuel tank. You should be able to turn the tank to any attitude and the clunk will fall to the lowest point. (All directions except for having the stopper facing down.)

Note: If you are planning on installing the Saito 200TI, the fuel tank will be oriented differently. Make sure the tank is built so the vent is pointing up with the fuel tank oriented as shown in the picture.

☐ **Step 8**

Tighten the M3 x 20 screw carefully—do not over tighten. This allows the rubber stopper to form a seal by being slightly compressed, thus sealing the fuel tank opening.

Important: Be sure to differentiate between the vent and fuel pickup tube. Once the tank is mounted inside the fuselage, it will be difficult to tell the tubes apart.

Note: The fuel tank will be installed in a later section.

Section 17A: Engine Installation (Saito 180GK)

Required Parts

- Fuselage
- Engine mount (2)
- #8 washers (8)
- Engine
- 8-32 x 1 $^1/_4$" screws (8)
- 8-32 nylon lock nuts (4)
- Plywood engine mount spacers (2)

Required Tools and Adhesives

- Phillips screwdriver
- Measuring device
- Adjustable wrench
- 11/32" socket wrench

Note: There are two engine installations in this instruction manual (Section 17A and Section 17B). Section 17A covers the installation of the Saito 1.80 Golden Knight (SAIE180GK). Section 17B covers the installation of the Saito 200 TI (SAIE200TI).

Note: The P-51 comes with the blind nuts preinstalled in the firewall. They are located for the installation of the Saito 1.80-size four-strokes. If you plan on using another engine, you may need to remove the blind nuts and drill new holes in the firewall for your particular engine.

Section 17B covers relocating the blind nuts for mounting the engine when using an engine mount different than supplied with the kit.

☐ **Step 1**

Locate the engine mount and the associated hardware.

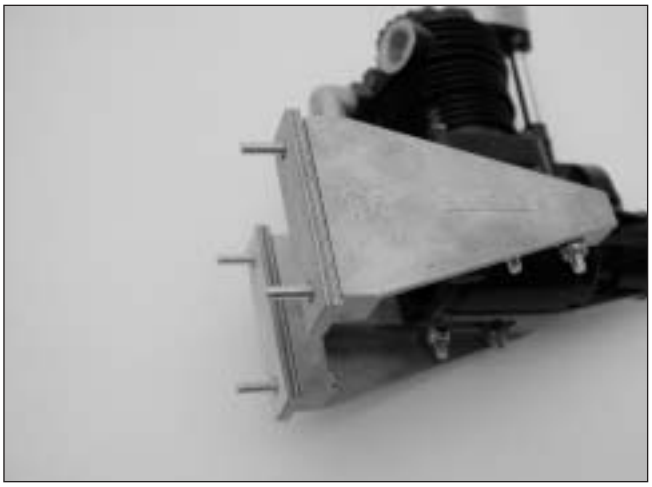
☐ **Step 2**

Temporarily install the engine to the rails using four 8-32 bolts, four washers and four lock nuts. Leave the bolts loose enough to allow the engine to slide on the engine mount.

Note: The engine mount is embossed with the correct orientation for the mounts.

☐ **Step 3**

Prepare the engine mount for installation by sliding four 8-32 bolts and washers through the engine mount. Position the plywood engine mount spacers onto the bolts as shown.

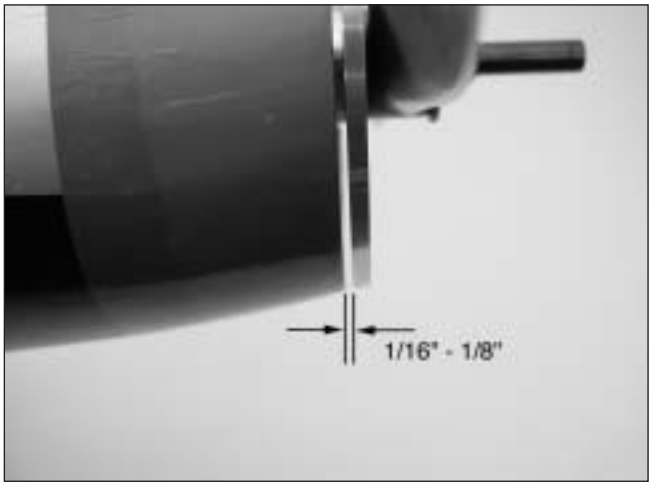


☐ **Step 4**

Install the engine mount.

☐ **Step 5**

Install the spinner back plate and propeller. Position the engine so there is between 1/16" and 1/8" gap between the back plate and fuselage.



☐ **Step 6**

Remove the spinner back plate and tighten the screws holding the engine to the mount. An 11/32" socket wrench will make this task a lot easier.

Section 17B: Engine Installation (Saito 200 TI)

Required Parts

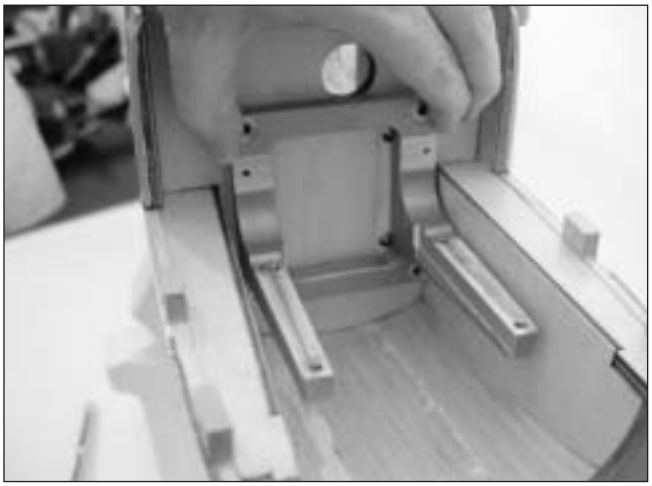
- Fuselage
- #8 washers (4)
- Felt-tipped pen
- Engine
- 8-32 x 1-1/4" screws (4)
- Associated engine mount

Required Tools and Adhesives

- Phillips screwdriver
- Adjustable wrench
- Drill Bit: 1/4"
- Drill
- Socket Wrench: 11/32"
- Measuring device

☐ **Step 1**

Check the fit of the engine mount you are planning on using. You may get lucky and not have to remove the blind nuts.

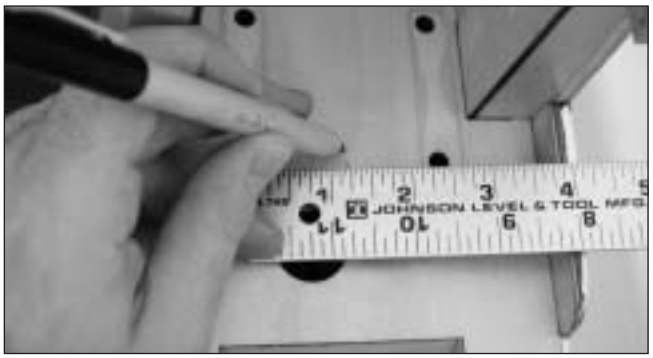


☐ **Step 2**

If you must remove the blind nuts, thread an 8-32 bolt partially into the nut. Lightly tap the bolt to pop the blind nut away from the firewall. This will prevent damaging the threads of the nuts. Trim the cross brace to allow for the removal of the blind nuts near the top of the fuselage.

☐ **Step 3**

Measure the distance between the original holes in the firewall. Make a mark centered right and left and top to bottom using a felt-tipped pen.



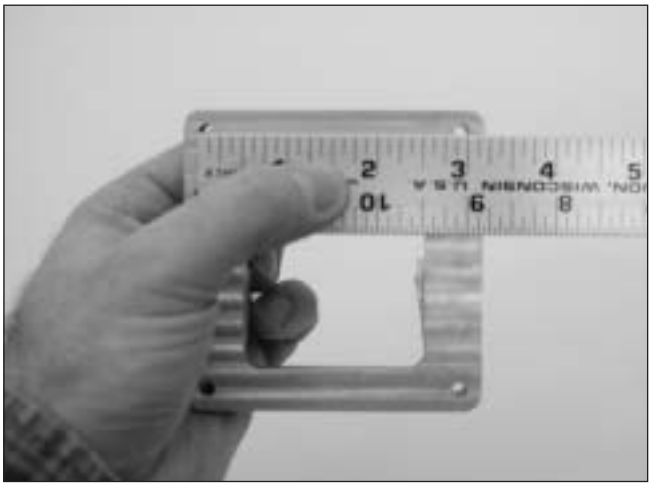
Important: The stock engine mount is offset 1/4" towards the top of the fuselage. Measure 1/4" towards the bottom of the fuse and make two marks for the horizontal centerline.

☐ **Step 4**

Connect the marks drawn in the previous step. Your new engine mount will centered here the two lines cross.

☐ **Step 5**

Measure and record the distance between the holes in your particular mount. Make sure your mount will be centered correctly when measuring.



☐ **Step 6**

Transfer the measurements made in the last step to the firewall. Remember to divide by two and measure from the centerline.

Note: Another option is to determine the center vertically and horizontally of your mount. Position the mount on the centerlines and mark the locations of the bolts directly on the firewall.

Section 17B: Engine Installation (Saito 200 TI)

☐ **Step 7**

Drill the locations for the new bolts using a 1/4" drill bit.

☐ **Step 8**

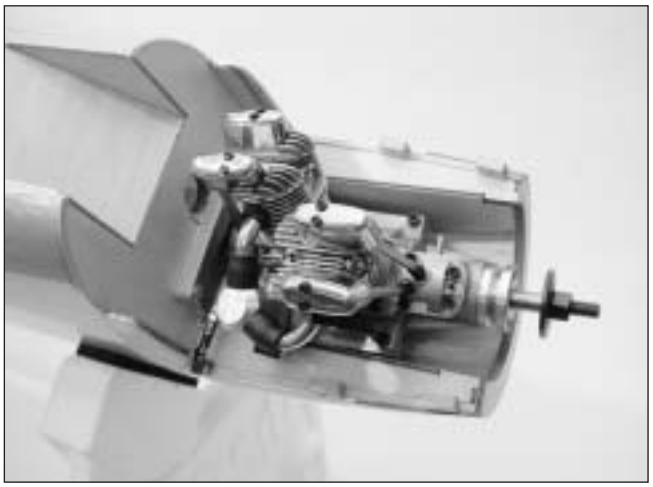
Install your particular motor mount using four 8-32 bolts, four washers and the blind nuts removed in Step 2.

☐ **Step 9**

Install any accessories that may be required for your particular engine. In the case of the Saito 200TI, a needed valve must be attached to the mount. Make any necessary adjustments to the fuselage to provide clearance if required.

☐ **Step 10**

Install the engine of your choice at this time. Use the method described in Step 5 of Section 17A to position the engine fore and aft.



Section 18: Throttle Pushrod and Fuel Tank

Required Parts

- Fuel tank assembly
- Foam: 1/4", 1/2"
- Throttle pushrod tube (15")
- Throttle pushrod (17 1/4")
- Fuel tubing (red and green)

Required Tools and Adhesives

- Drill Bit: 1/8"
- Drill
- Felt-tipped pen
- Hobby knife
- Masking tape

☐ **Step 1**

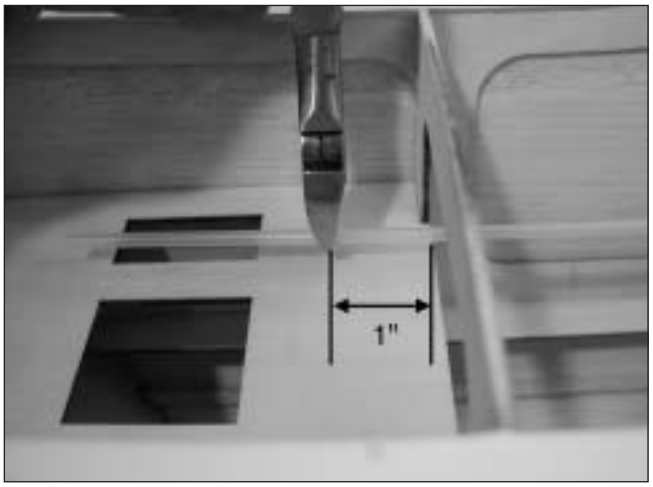
Determine the proper location for the throttle pushrod. Mark the location with a felt-tipped pen and drill the firewall for the pushrod tube using a drill and 1/8" drill bit. Remove the engine if necessary.

☐ **Step 2**

Test fit the throttle pushrod tube through the firewalland into the fuselage. Once satisfied with the fit, mix1/4 ounce of 6-minute epoxy and glue the pushrodinto the firewall. Allow the epoxy to fully cure before continuing.

☐ **Step 3**

Trim the throttle pushrod tube so it extends 1" onto the servo tray.



Section 18: Throttle Pushrod and Fuel Tank

☐ **Step 4**

Install the throttle pushrod into the tube and connect it to the throttle arm. You may need to remove the throttle control arm of the carburetor to connect the Z-bend to the throttle arm.

☐ **Step 5**

Wrap the fuel tank with 1/4" foam. Secure the foam using masking tape.

☐ **Step 6**

Connect the two pieces of fuel tubing to the fuel tanks pickup and vent tubes. Install the fuel tank into the fuselage from the radio compartment. The stopper and fuel tubes will pass through the round hole in the firewall. Use more foam to hold the tank in place and protect from vibration.

Hint: Connect the red tube to the vent and the green tube to the pickup.

Important: The Saito 200TI will require a new hole drilled in the firewall for the fuel tank stopper and fuel lines.

Note: Make the proper connections to the engine using the engine manufacturer's instructions.

Section 19: Radio Installation

Required Parts

- Fuselage assembly
- Receiver
- Switch harness
- Foam
- Receiver battery
- Servos (4) (not included)

Required Tools and Adhesives

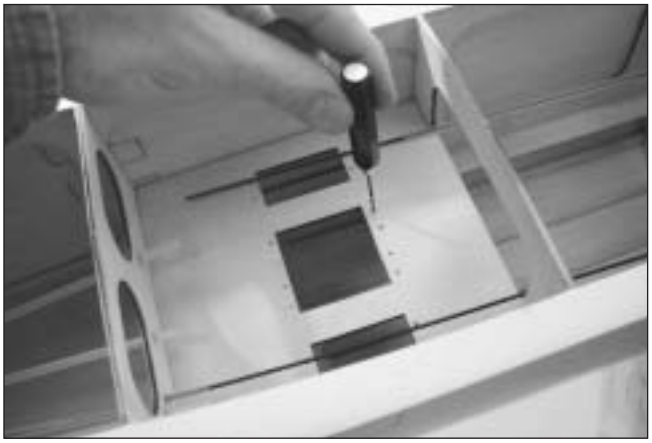
- Drill Bit: 1/16"
- Thin CA
- Drill
- Hobby knife

☐ **Step 1**

Install the recommended servo hardware (grommets and eyelets) supplied with your radio system onto four servos (elevator (2), rudder and throttle). Temporarily install the four servos into the openings and mark the location of the servo mounting screws.

☐ **Step 2**

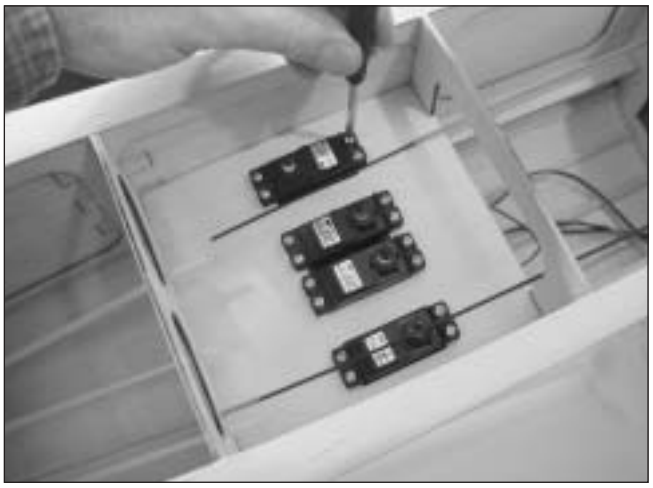
Remove the servos and drill the holes for the servo mounting screws using a 1/16" drill bit.



Note: Place a drop of thin CA onto each screw hole to harden the wood around the hole. Allow the CA to fully cure before installing the servos.

☐ **Step 3**

Install the servos as shown. The output shaft of the throttle servos faces rearward, while the remaining servos will face forward. Secure the servos using the screws provided with the servos.



☐ **Step 4**

Mount the radio switch in the side of the fuselage. Glue small scraps of plywood to the balsa sheeting inside the fuselage to give the screws something to bite into.

Section 19: Radio Installation

☐ **Step 5**

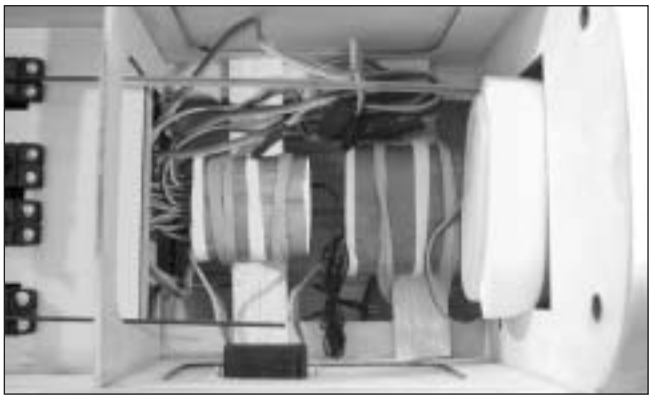
Connect any necessary extensions and Y-harnesses necessary to connect up the retract, aileron and flap servos. Connect the elevator, rudder and throttle servo leads to the receiver.

☐ **Step 6**

Wrap the receiver in protective foam to prevent damage that may be cause by engine vibration.

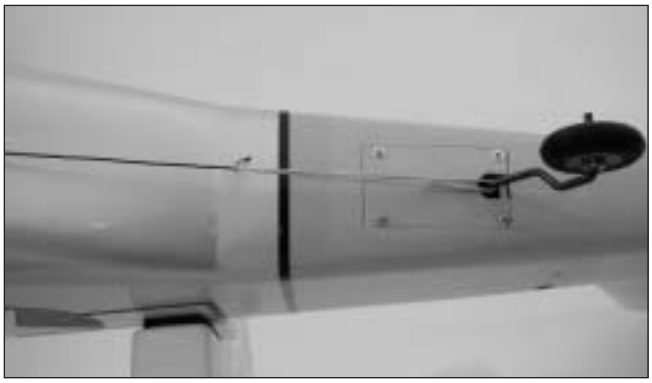
☐ **Step 7**

Wrap the receiver battery in protective foam as you did the receiver. Temporarily mount the receiver and battery into the fuselage. It may be necessary to relocate the battery forward or aft to balance the model as described in the section “Control Throws and Center of Gravity.”



☐ **Step 8**

Route the antenna out through the bottom of the fuselage and secure it to the tail wheel with rubber bands.



Section 20: Rudder and Elevator Linkages

Required Parts

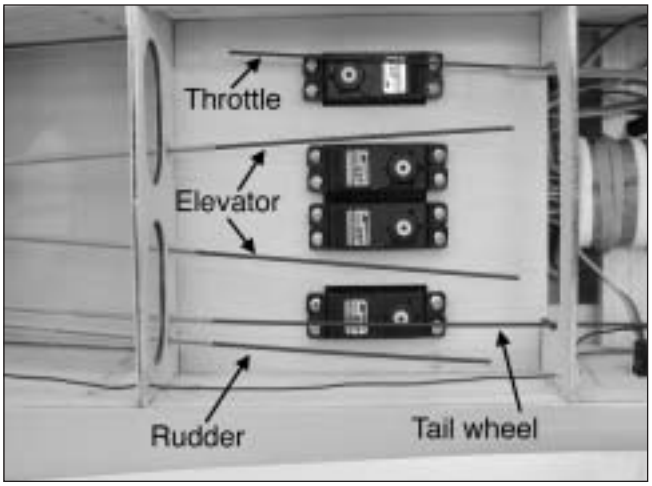
- Fuselage assembly
- Nylon clevis (3)
- Nylon wire keepers (4)
- #2 nuts (6)
- #2 x 1 $^{5}/_{8}$" threaded rods (3)
- Pushrod wires (3)
- Clevis keeper (3)
- Control horns (3)
- #2 x 3/8" screw (6)

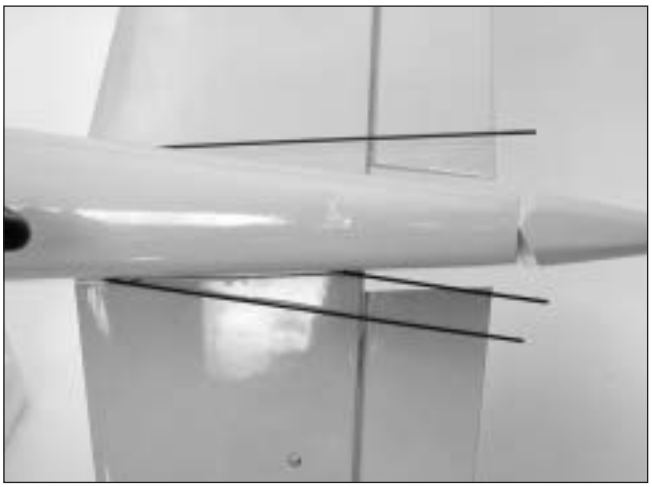
Required Tools and Adhesives

- Drill Bit: 1/16" and 5/64"
- Hobby knife
- Felt-tipped pen
- Threadlocking compound
- Thin CA
- Drill

☐ **Step 1**

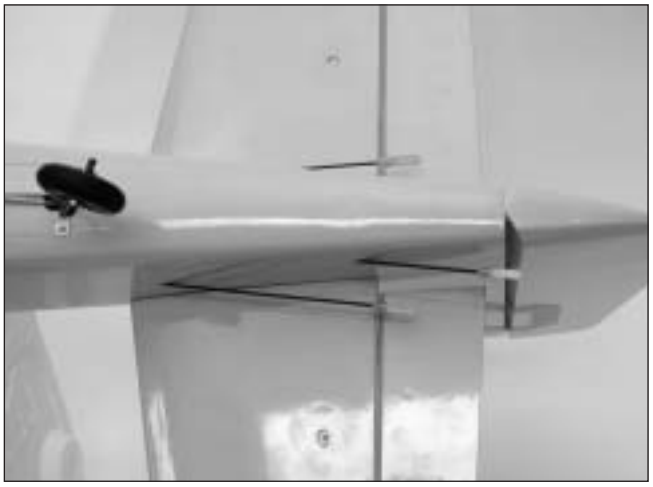
Slide the rudder and elevator pushrod wires into the tube in the fuselage. Make sure the threaded portion of the wires is on the outside of the plane near the tail group.





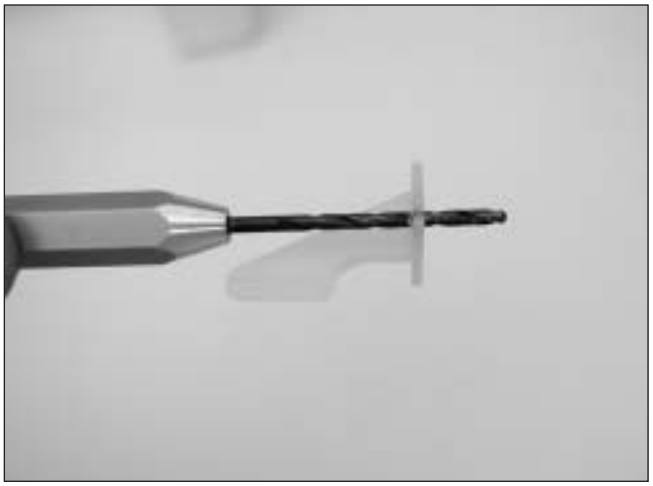
☐ **Step 2**

Slide a clevis keeper onto a nylon clevis. Thread the clevis onto the wire a minimum of 10 turns. Repeat this step for both elevators' linkages and the rudder linkage.



☐ ☐ **Step 3**

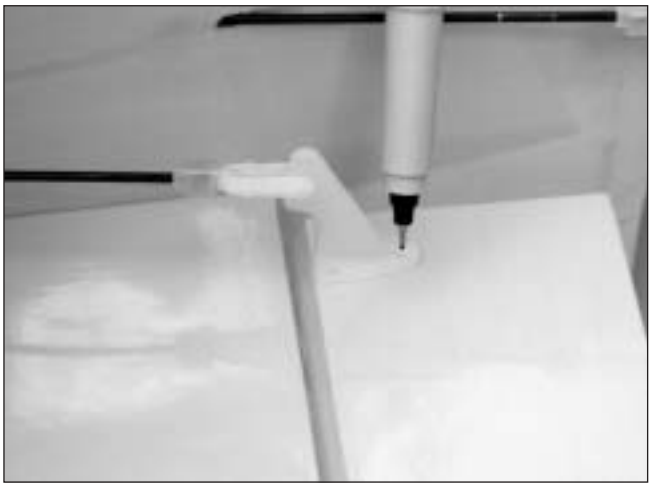
Remove the back plate from a control horn using side cutters or a sharp hobby knife. Use a 5/64" drill bit to drill out the mounting holes in the control horn.



Section 20: Rudder and Elevator Linkages

☐ ☐ **Step 4**

Attach the clevis to the control horn. Position the control horn on the elevator so the control rod is straight, and the holes in the control horn aligns with the hinge line of the elevator. Mark the position for the mounting holes using a felt-tipped pen.



☐ ☐ **Step 5**

Drill three 1/16" holes at the locations marked in the previous step. The holes only need to be 5/16" deep: don't drill through the top of the elevator.

☐ ☐ **Step 6**

Install one of the #2 x 3/8" screws in a hole drilled, then remove it. Place 2-3 drops of thin CA into the hole to harden the wood. This will eliminate the potential of the screw pulling out of the wood. Repeat this for each of the three holes.

☐ ☐ **Step 7**

Attach the control horn using three #2 x 3/8" screws.

☐ ☐ **Step 8**

Center the elevator servo electronically using the radio system. Install a servo arm onto one of the elevator servos. Physically place the elevator control surface in neutral. Mark the pushrod where it crosses the holes in the servo arm.

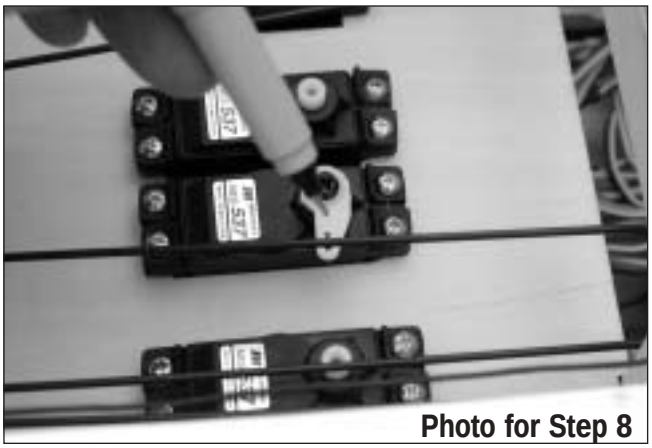


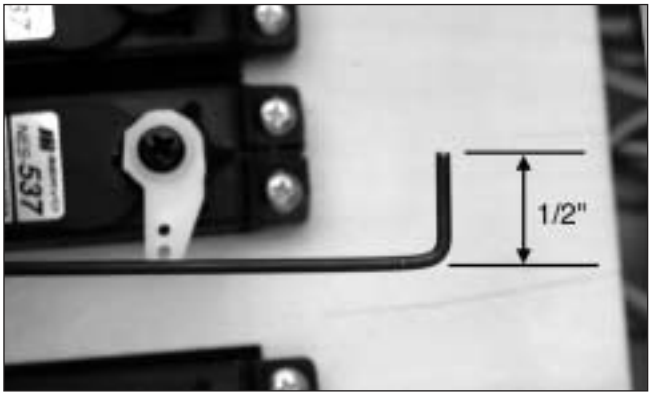
Photo for Step 8

☐ ☐ **Step 9**

Bend the wire 90 degrees at the mark made in the previous step

☐ ☐ **Step 10**

Cut the wire 1/2" above the bend.



☐ ☐ **Step 11**

Slide the wire through the outer hole in the elevator servo arm. Secure the wire using a nylon wire keeper.

☐ **Step 12**

Repeat Steps 3 through 11 for the remaining elevator half.

☐ **Step 13**

Center the rudder servo electronically using the radio system. Install a servo arm onto the rudder servo. Physically place the tail wheel in neutral. Mark the pushrod where it crosses the holes in the servo arm.

☐ **Step 14**

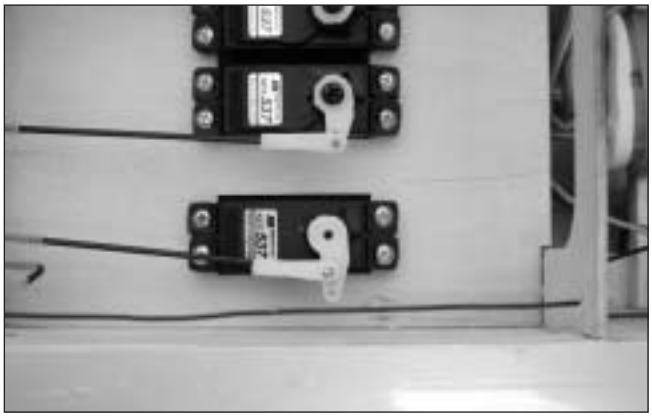
Bend the wire 90 degrees at the mark made in the previous step.

☐ **Step 15**

Cut the wire 1/2" above the bend.

☐ **Step 16**

Slide the wire through the inner hole in the rudder servo arm. Secure the wire using a nylon wire keeper.



Section 20: Rudder and Elevator Linkages

☐ **Step 17**

Remove the back plate from the last control horn using side cutters or a sharp hobby knife.

☐ **Step 18**

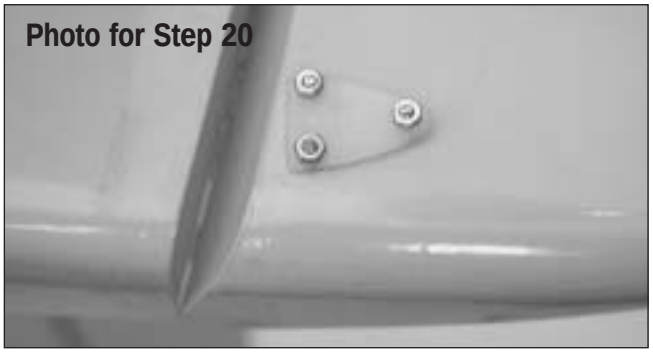
Attach the clevis to the control horn. Position the control horn on the rudder so the control rod is straight, and the front edge of the control horn aligns with the front edge of the bevel on the rudder. Mark the position for the mounting holes using a felt-tipped pen.

☐ **Step 19**

Drill the locations marked in the last step using a 1/16" drill bit. These three holes will be drilled completely through the rudder. Take your time, as each hole must be parallel in order to properly mount the rudder control horn.

☐ **Step 20**

Thread three #2 nuts onto the threaded rods. Slide the rod through the control horn, then through the rudder. Attach the back plate on the opposite side of the rudder as the control horn. Finally, thread three nuts onto the rods. Tighten the nuts, but don't crush the balsa. Use threadlocking compound on the nuts to prevent them from loosening during flight.



☐ **Step 21**

Physically place the rudder control surface in neutral. Mark the pushrod where it crosses the holes in the servo arm.

☐ **Step 22**

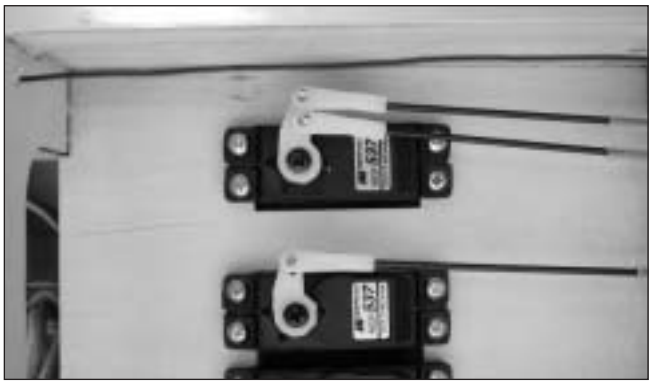
Bend the wire 90 degrees at the mark made in the previous step

☐ **Step 23**

Cut the wire 1/2" above the bend.

☐ **Step 24**

Slide the wire through the outer hole in the rudder control horn. Secure the wire using a nylon wire keeper.



Section 21: Throttle Linkage Installation

Required Parts

- Easy connector
- M3 x 8 screw
- Connector back plate

Required Tools and Adhesives

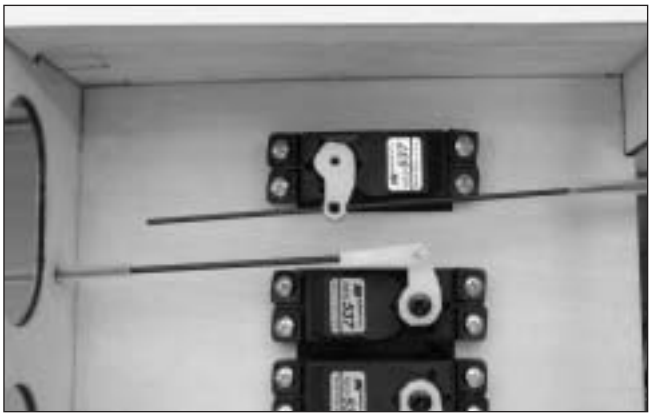
- Phillips screwdriver
- Pliers
- Drill Bit: 3/32"
- Drill

☐ **Step 1**

Use a 3/32" drill bit to drill out the holes in a servo arm. Attach an easy connector to the arm using a connector back plate.

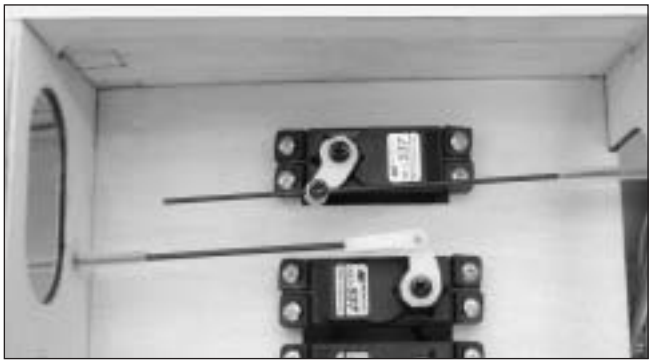
☐ **Step 2**

Center the throttle stick and trim with both the receiver and transmitter on. Slide the easy connector onto the throttle pushrod. Install the throttle servo arm in the neutral position as shown.



☐ **Step 3**

Move the throttle stick and trim to low. Check to make sure the carburetor will move to the low position when operating the servo. Install an M3 x 8 screw to secure the easy connector to the throttle pushrod. Check the movement of the throttle to verify there is no binding at either low or high throttle. If there is, make the necessary adjustment to eliminate any binding. Install the throttle servo arm screw when complete.



☐ **Step 4**

Use scrap wood to make a brace for the throttle pushrod tube near the servo as shown.

Section 22: Attaching the Cowl

Required Parts

- Fuselage assembly
- Cowl
- Mounting screws (6)

Required Tools and Adhesives

- Felt-tipped pen
- Hobby knife
- Moto-tool w/cut-off wheel and sanding drum

☐ **Step 1**

Mount the cowl using the #2 screws provided. Make the appropriate cutouts in the cowl for the muffler exhaust and engine cooling.

Note: If you are using the Saito 200TI, it will be required to install a baffle inside the cowl to direct air over the rear cylinder. Make the baffle from 1/16" balsa. Be sure to fuel-proof the balsa before flying.

☐ **Step 2**

Install the propeller and spinner.

Section 23: Cockpit Details

Required Parts

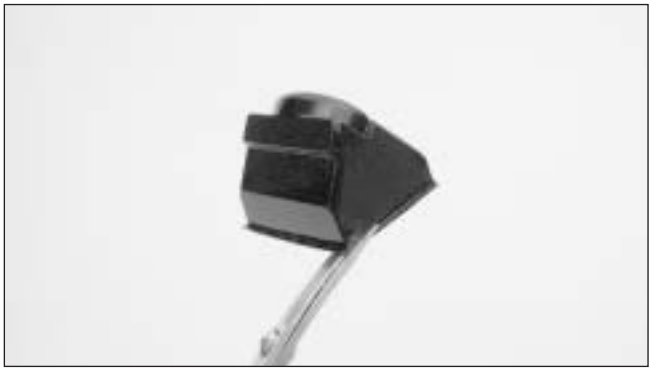
- Fuselage assembly
- Wing assembly
- Plastic cockpit detail
- Decal sheet
- Painted canopy

Required Tools and Adhesives

- Hobby knife
- Canopy scissors
- Shoe Goo
- 6-minute epoxy

☐ **Step 1**

Cut out and trim the cockpit and exhaust details using a pair of scissors.



☐ **Step 2**

Cut out the instrument panel decal and apply.

☐ **Step 3**

Glue the cockpit details to the fuselage using Shoe Goo or similar type adhesive, using the pictures on thebox as a guide. Use tape to hold the parts until the adhesive cures.

☐ **Step 4**

Glue the clear gun site into position using 6-minute epoxy.

☐ **Step 5**

Glue the exhaust into position using Shoe Goo.

☐ **Step 6**

Glue the guns into position using Shoe Goo.

Section 24: Attaching the Canopy

Required Parts

- Fuselage assembly
- Canopy

Required Tools and Adhesives

- Canopy scissors
- Canopy glue (RC560)

☐ **Step 1**

Glue the canopy to the fuselage using RC560 canopy glue. Tape the canopy in place with masking tape and allow the glue to cure overnight.

Section 25: Applying the Decals

Required Parts

- Fuselage assembly
- Wing assembly
- Decals

Required Tools and Adhesives

- Canopy scissors
- Hobby knife
- Paper towel
- Spray bottle
- 2–3 drops dish soap

☐ **Step 1**

Locate the decal sheet and cut out the decals for the P-51 using a sharp hobby knife and scissors.

☐ **Step 2**

Use the photos on the box to locate the decals. Use a spray bottle with 2–3 drops of dish soap added to the water and spray both the fuselage and sticky side of the decal. This will allow you to reposition the decal if necessary. Once satisfied with the position, use a paper towel to squeegee out the water. Allow the decal to dry overnight.

Note: There may be some clouding under the decal, but this will go away as the decal dries.

Control Throws and Center of Gravity

Recommended CG Location

An important part of preparing the aircraft for flight is properly balancing the model. This is especially important when various engines are mounted.

Caution: Do not inadvertently skip this step!

The recommended Center of Gravity (C.G.) location for the P-51 1.50 is 6 3/8" behind the leading edge of the wing measured at the fuselage sides. If necessary, move the battery pack or add weight to either the nose or the tail until the correct balance is achieved. Stick-on weights are available at your local hobby shop and work well for this purpose.

The following control throws offer a good place to start with your first flights. We recommend only one rate setting for the P-51. As you become more familiar with the handling of your model, you may wish to add a second rate setting.

Once the control throws for the ailerons and flaps have been set, tighten the 4-40 nuts against the clevises to prevent them from loosening during flight. It is also highly suggested to use threadlocking compound.

Recommended Control Throws

	Low rate	High rate
Aileron	1/2" (14°) up	3/4" (18°) up
	1/2" (14°) down	3/4" (18°) down
Elevator	5/8" (12°) up	3/4" (15°) up
	5/8" (12°) down	3/4" (15°) down
Rudder	1 7/8" (20°) left	2 1/2" (30°) left
	1 7/8" (20°) right	2 1/2" (30°) right
Flaps	1 1/8" (15°) down	2 1/2" (38°) down

Preflight at the Field

☐ **Step 1**

Before each flying session, range-check your radio. This is accomplished by turning on your transmitter with the antenna collapsed. Turn on the radio in your airplane. With your airplane on the ground, you should be able to walk 30 paces away from your airplane and still have complete control of all functions. If not, don't attempt to fly! Have your radio equipment checked out by the manufacturer.

☐ **Step 2**

Double-check that all controls (aileron, elevator, throttle, rudder) move in the correct direction.

☐ **Step 3**

Before you fly, be sure that your batteries are fully charged per the instructions included with your radio.

Adjusting the Engine

☐ **Step 1**

Completely read the instructions included with your engine and follow the recommended break-in procedure.

☐ **Step 2**

At the field, adjust the engine to a slightly rich setting at full throttle and adjust the idle and low-speed needle so that a consistent idle is achieved.

☐ **Step 3**

Before you fly, be sure that your engine idles reliably, transitions and runs at all throttle settings. Only when this is achieved should any plane be considered ready for flight.

2003 Official AMA National Model Aircraft Safety Code

Effective January 1, 2003
Model Flying MUST be in accordance with this Code in order for AMA Liability Protection to apply.

GENERAL

1) I will not fly my model aircraft in sanctioned events, air shows or model flying demonstrations until it has been proven to be airworthy by having been previously, successfully flight tested.

2) I will not fly my model higher than approximately 400 feet within 3 miles of an airport without notifying the airport operator. I will give right-of-way and avoid flying in the proximity of full-scale aircraft. Where necessary, an observer shall be utilized to supervise flying to avoid having models fly in the proximity of full-scale aircraft.

3) Where established, I will abide by the safety rules for the flying site I use, and I will not willfully and deliberately fly my models in a careless, reckless and/or dangerous manner.

4) The maximum takeoff weight of a model is 55 pounds, except models flown under Experimental Aircraft rules.

5) I will not fly my model unless it is identified with my name and address or AMA number, on or in the model. (This does not apply to models while being flown indoors.)

6) I will not operate models with metal-bladed propellers or with gaseous boosts, in which gases other than air enter their internal combustion engine(s); nor will I operate models with extremely hazardous fuels such as those containing tetranitromethane or hydrazine.

7) I will not operate models with pyrotechnics (any device that explodes, burns, or propels a projectile of any kind) including, but not limited to, rockets, explosive bombs dropped from models, smoke bombs, all explosive gases (such as hydrogen filled balloons), ground mounted devices launching a projectile. The only exceptions permitted are rockets flown in accordance with the National Model Rocketry Safety Code or those permanently attached (as per JATO use); also those items authorized for Air Show Team use as defined by AST Advisory Committee (document available from AMA HQ). In any case, models using rocket motors as a primary means of propulsion are limited to a maximum weight of 3.3 pounds and a G series motor. (A model aircraft is defined as an aircraft with or without engine, not able to carry a human being.)

8) I will not consume alcoholic beverages prior to, nor during, participation in any model operations.

9) Children under 6 years old are only allowed on the flight line as a pilot or while under flight instruction.

RADIO CONTROL

1) I will have completed a successful radio equipment ground range check before the first flight of a new or repaired model.

2) I will not fly my model aircraft in the presence of spectators until I become a qualified flier, unless assisted by an experienced helper.

3) At all flying sites a straight or curved line(s) must be established in front of which all flying takes place with the other side for spectators. Only personnel involved with flying the aircraft are allowed at or in the front of the flight line. Intentional flying behind the flight line is prohibited.

2003 Official AMA National Model Aircraft Safety Code

Continued

4) I will operate my model using only radio control frequencies currently allowed by the Federal Communications Commission. (Only properly licensed Amateurs are authorized to operate equipment on Amateur Band frequencies.)

5) Flying sites separated by three miles or more are considered safe from site-to site interference, even when both sites use the same frequencies. Any circumstances under three miles separation require a frequency management arrangement which may be either an allocation of specific frequencies for each site or testing to determine that freedom from interference exists. Allocation plans or interference test reports shall be signed by the parties involved and provided to AMA Headquarters. Documents of agreement and reports may exist between (1) two or more AMA Chartered Clubs, (2) AMA clubs and individual AMA members not associated with AMA Clubs, or (3) two or more individual AMA members.

6) For Combat, distance between combat engagement line and spectator line will be 500 feet per cubic inch of engine displacement. (Example: .40 engine = 200 feet.); electric motors will be based on equivalent combustion engine size. Additional safety requirements will be per the RC Combat section of the current Competition Regulations.

7) At air shows or model flying demonstrations a single straight line must be established, one side of which is for flying, with the other side for spectators.

8) With the exception of events flown under AMA Competition rules, after launch, except for pilots or helpers being used, no powered model may be flown closer than 25 feet to any person.

9) Under no circumstances may a pilot or other person touch a powered model in flight.

Organized RC Racing Event

10) An RC racing event, whether or not an AMA Rule Book event, is one in which model aircraft compete in flight over a prescribed course with the objective of finishing the course faster to determine the winner.

A. In every organized racing event in which contestants, callers and officials are on the course:

1. All officials, callers and contestants must properly wear helmets, which are OSHA, DOT, ANSI, SNELL or NOCSAE approved or comparable standard while on the racecourse.

2. All officials will be off the course except for the starter and their assistant.

3."On the course" is defined to mean any area beyond the pilot/staging area where actual flying takes place.

B. I will not fly my model aircraft in any organized racing event which does not comply with paragraph A above or which allows models over 20 pounds unless that competition event is AMA sanctioned.

C. Distance from the pylon to the nearest spectator (line) will be in accordance with the current Competition Regulations under the RC Pylon Racing section for the specific event pending two or three pylon course layout.

11) RC Night flying is limited to low performance models (less than 100 mph). The models must be equipped with a lighting system that clearly defines the aircraft's attitude at all times.

HANGAR 9®

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4105 Fieldstone Road
Champaign, Illinois 61822
(217) 355-9511
www.horizonhobby.com

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